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FRIDAY, JANUARY 17, 1902.

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THE GEOLOGICAL SOCIETY OF AMERICA.

THE fourteenth annual meeting of the Geological Society of America was held in Rochester, N. Y., from Tuesday, December 31, 1901, to Thursday, January 2, 1902. An informal session of the Council, to canvass the ballots for officers and fellows, was held on Monday night, December 30, at the Whitcomb House, the headquarters of the Society. A formal session of the Council was held at 9 o'clock Tuesday morning in Sibley Hall, University of Rochester.

Owing to the unavoidable absence of President Walcott, the meeting was called to order by Professor Newton H. Winchell, shortly after 10 o'clock, in the geological lecture room of the University of Rochester, and the address of welcome and response were postponed until the arrival of the president. The report of the Council and officers having been printed and distributed to the members, its consideration was laid over until Thursday. Professor R. E. Dodge and Dr. E. O. Hovey were then appointed auditing committee. The vote for officers for 1902 was declared as follows:

President, N. H. Winchell, Minneapolis, Minn; *First Vice-President*, S. F. Emmons, Washington, D. C.; *Second Vice-President*, J. C. Branner, Stanford University, Cal.; *Secretary*, H. L. Fairchild, Rochester, N. Y.; *Treasurer*, I. C. White, Morgantown, W. Va.; *Editor*, J. Stanley-Brown,

Washington, D. C.; *Librarian*, H. P. Cushing, Cleveland, O.; *Councillors*, C. W. Hayes, Washington, D. C., J. P. Iddings, Chicago, Ill.

The following were declared elected fellows of the Society:

Ermine Cowles Case, A.B., A.M. (Kansas State University, 1893), M.S. (Cornell Univ., 1895), Ph.D. (Univ. of Chicago, 1896), Instructor in State Normal School, Milwaukee, Wis.; Arthur Gray Leonard, A.B., A.M. (Oberlin), Ph.D. (Johns Hopkins Univ.), Des Moines, Iowa, Assistant State Geologist, Iowa Geological Survey; Charles Hyde Warren, Ph.B. (Yale, 1896), Ph.D. (Yale, 1899), Boston, Mass., Instructor in Geology, Mass. Inst. Technology.

The following memorials were read: George M. Dawson, by Frank D. Adams; Ralph D. Lacoe, prepared by David White, read by the secretary; Theodore G. White, prepared by J. F. Kemp, read by R. E. Dodge.

The following memorials were not read, owing to the absence of the authors: Edward W. Claypole, by Theo. B. Comstock; Joseph Le Conte, by W J McGee.

President Walcott, having meanwhile arrived, took the chair, and the address of welcome was delivered by Dr. Rush Rhees, president of the University of Rochester. He complimented the Society on its work, and the city and University of Rochester on the honor conferred by the meeting of the Society within their confines. He saw no special reason why Rochester should be so favored, but hoped that this meeting would stimulate its citizens to take a deeper interest in higher education. Finally he welcomed the Society most cordially to the University and the city. President Walcott, in responding, offered many reasons why the Society should meet in Rochester, for that city was intimately connected with the early study of geology in this country, and from it have proceeded many eminent members of the Society.

The following scientific papers were then read:

The Ordovician Succession in Eastern Ontario: H. M. Ami, Ottawa, Canada.

This paper dealt with the succession of paleozoic sediments in that portion of the province of Ontario, Canada, which is traversed by the Frontenac axis or ridge of Archæan rocks which crosses the St. Lawrence river between the city of Kingston and Brockville and connects with the great Adirondack massif to the south.

The Frontenac axis divides the Ordovician strata, to the east as well as to the west, into two series, which, though not very distant, geographically speaking, are nevertheless marked by important features.

On the east side of the axis the normal succession of strata from the Potsdam to the Medina is found, but on the west side of the axis the pre-Cambrian rocks are overlain by the Rideau sandstone, succeeded without stratigraphic break by the Birdseye, Black River and Trenton strata. Fossils, except *Scolithus*, are absent in the Rideau sandstone and the problem of the equivalency of this sandstone was stated.

In the discussion Mr. Bailey Willis considered that the Rideau sandstone is the formational equivalent of the Potsdam, but not its equivalent in age. Professor W. M. Davis considered it pre-Black-river in time, but of unsettled age. Mr. Walcott, emphasizing the shifting character of the deposits around the Adirondacks, suggested that the Rideau was the shore equivalent of the Calciferous (Beekmantown) and Chazy.

Stratigraphic and Faunal Succession in the Hamilton Group of Thedford, Ontario: Hervey W. Shimer and A. W. Grabau, New York, N. Y. Read by Mr. Shimer.

The Thedford Hamilton admits of a three-fold division, closely corresponding to that of the Hamilton of western New York. The limitations of the characteristic

species correspond in a remarkable degree to those observed in western New York. The encrinal limestone is the central member in both localities, and the chief coral zone lies just above this stratum in both. A striking dissimilarity exists between the Hamilton of Thedford and the corresponding horizon (Traverse group) of Alpena, Michigan, the next important outcrop of this formation to the northwest. The difference is shown chiefly in the faunas. The paper was discussed by J. M. Clarke, H. S. Williams and A. W. Grabau.

The Traverse Group of Michigan: AMADEUS W. GRABAU, New York, N. Y.

Two sections, one on Thunder Bay and the other on Little Traverse Bay, show the strongly calcareous facies of the strata, which is most marked in the western section. In both sections the upper limit of the Traverse groups is marked by the St. Clair Black shale, and the lowest portion of the group is a bed of blue clay 80 feet thick. The fauna varies with the rock. The reef character of the limestone strata was discussed. The faunal character of the strata was discussed by Professor H. S. Williams, and the reef structure by Mr. Chas. D. Walcott. The Society then adjourned for lunch, many members availing themselves of the opportunity offered to inspect Ward's Natural History establishment, where a lunch was provided.

The afternoon session was called to order at 2 o'clock. The following papers were read:

The Lower Carboniferous Area in Indiana: T. C. HOPKINS, Syracuse, N. Y.

The Lower Carboniferous strata in west central Indiana undergo quite marked changes along the strike. The outcrops have been traced in detail and represented on the State map. The heavy calcareous deposits of the southern part of the area thin out to the northward and give way to argillaceous and sandy deposits. This transition has an important bearing on the geological history of this region.

The following subdivisions, based on lithologic but not paleontologic features, were discussed. *Kaskaskia, Mitchell, Bedford; Harroddsburg and Knobstone.*

The paper was briefly discussed by W. B. Scott, J. B. Wolf and W. M. Davis. Dr. A. C. Lane discussed the relations of similar beds in Michigan, and raised the question as to the origin of the silica in the beds under consideration, and its value as a horizon marker. He suggested that it might be supplied by volcanic eruptions, even from a distance. Mr. Walcott briefly discussed the economic importance of the limestones of these formations. Brief remarks were also made by Dr. A. F. Foerste, and responded to by Dr. Hopkins.

Geological Horizon of the Kanawha Black Flint: I. C. WHITE, Morgantown, W. Va.

The first comprehensive description of the Kanawha Black Flint was given by W. B. Rogers, and besides this, the works of Stevenson, the Platt Brothers and H. M. Chance were considered as having added most to our knowledge of the details of the Appalachian carboniferous stratigraphy. The name Conemaugh, proposed by Franklin Platt, has, according to W. B. Clark, priority over Elk River series applied to the 'Barren measures' of Rogers, by White. Platt's name was accepted for the beds lying between the Pittsburg coal and the Upper Freeport coal. The position of the Kanawha Black Flint is at the base of the Conemaugh series, though David White places it some 200 feet down in the Allegheny series from paleobotanic evidence. The work of Messrs. Campbell and Mendenhall was reviewed, the speaker disagreeing with their interpretations. The problem was attacked anew by the speaker and from a new standpoint, by tracing the

basal coalbed, and the accompanying Mahoning sandstone, as well as the Red bed series with its included crinoidal limestone, from the Pennsylvania line to West Virginia. The results of this new work were in close agreement with those arrived at by the speaker in previous studies. The speaker concluded with the following corollaries:

A. Some coal beds, limestones and sandstones may be followed for hundreds of miles.

B. Stratigraphy is superior to paleobotany in correlations.

C. Paleobotany should be used merely as an aid to stratigraphy.

The paper brought out a warm discussion, in which Professor Stevenson, Bailey Willis, I. C. White and others participated.

President Walcott read a telegram of greeting from the Cordilleran section of the Society, in session in San Francisco, Cal. On motion of Professor Stevenson a similar greeting was returned.

The next paper read was:

Correlation of the Coal Measures of Maryland: Wm. B. Clark and G. C. Martin, Baltimore, Md. Read by Professor Clark.

The object of this paper was to show the equivalency of the coal seams of Maryland with those of adjacent regions in Pennsylvania and West Virginia. The determination of this equivalency is based not only on the parallelism of lithologic sequence over wide areas, as shown both by the structure of the seams themselves and of the intervening beds, but also on the fossiliferous zones which have been found at numerous points throughout this district. The similarity of the chemical composition in each vein over wide areas is also strikingly shown.

Local names, heretofore used by the Maryland survey, were abandoned, and those used in Pennsylvania and West Virginia were adopted. The paper was discussed by I. C. White, J. J. Stevenson and Bailey Willis.

Areal Distribution of the Potomac Group in Maryland: W. B. Clark and A. Bibbins, Baltimore, Md. Read by W. B. Clark.

The lowest member of the Atlantic coastal plain series is the Potomac group, so named by W J McGee, who considered it a single unit. The age of this group was considered to be Cretaceous by paleobotanists, and Jurassic by Marsh and other vertebrate paleontologists. The authors have described a fourfold division of the Potomac into Patuxent, Arundel, Patapsco and Raritan beds, and indicated the distinctive characters of each. The areal distribution, which varies for the different members, was briefly discussed by the speaker. Marsh found Dinosaur remains in the Arundel, which, with the underlying Patuxent beds, is Jurassic. The plant remains were found in the upper or Raritan beds, and these are cretaceous. The lower members gradually die out northward, the Patuxent and Arundel not occurring in New Jersey, though some of the lower members appear to be present in Pennsylvania. The disappearance is due to a northward transgression of the sea and a consequent overlap of the newer upon the older beds. The paper was briefly discussed by Professors Hopkins and Holmes, and questions answered by Professor Clark.

On some Joint Veins: G. K. Gilbert, Washington, D. C.

A limestone stratum between beds of Cambrian shale from western Utah shows innumerable veinlets of the segregation type. In a small hand specimen passed around, 180 veins were counted. These belong to 22 systems, which are grouped in two groups, the minor of which is aligned

with the dip of the strata (which is from 10 to 15 degrees) and the major group with the strike. They are believed to be formed along joints. The dip joint-veins are normal to the plane of stratification, the strike veins vary from normal to the stratification, to verticality, and appear to have been formed at different periods. The grouping of the joint-veins in two directions appears in all the beds examined. The scale of the jointing is related to that of the bed, which is a thin one.

Professor J. E. Wolf discussed the origin of the jointing by contraction of the rock on loss of water.

Professor B. K. Emerson considered that they had all the aspect of torsion joints as produced in glass artificially. He referred to Crosby's theory, according to which an earthquake shock, passing through a stratum in which a slight torsion was induced, would produce the joints of the type described. Gilbert considered Crosby's theory the most plausible, and that the shrinkage theory was not applicable here. Bailey Willis thought that expansion of the rocks may have been a cause in the fracturing. Gilbert emphasized the fact that no apparent cracks existed. N. H. Winchell mentioned similar phenomena in the Minnesota mica schists, which apparently were basic sediments. A. C. Lane recalled joints of similar type but larger scale in the diabase sheet of Nahant, Mass.

Regeneration of Clastic Feldspar: N. H. WINCHELL, Minneapolis, Minn.

The literature was reviewed and the speaker's own observations given. Three phases of alterations of clastic feldspars occur: (1) Decay, (2) secondary enlargement, (3) secondary enlargement but the newly added material extended so as to grow into crevices between the other grains of the rock.

The Society then adjourned.

The evening session of the Society was opened at 8:40 o'clock in the college chapel, Anderson Hall. President Charles D. Walcott delivered the annual address, his subject being: 'The Outlook of the Geologist in America.' He reviewed the work now in progress in this country, and sketched a bright future for American geology.

Second day, Wednesday, January 1, 1902. The Council of the Society met in session at Sibley Hall at 9 o'clock.

The meeting of the Society was called to order at 9:50 by President Walcott. The motion was made that the previously distributed report of the Council be accepted. Carried.

The report of the photograph committee, prepared by N. H. Darton, was read by the secretary. The report was accepted, and the usual appropriation voted.

Professor Dodge presented the report of the auditing committee, stating that the committee had examined the treasurer's accounts and found them correct. The report was accepted. The Council recommended that the name of the western section of the Society be pronounced Cordil-ya'ran, which is the Spanish pronunciation, used in California. The recommendation was adopted.

The Society then proceeded to the reading of papers:

Geology of the Snake River Plains, Idaho: ISRAEL C. RUSSELL, Ann Arbor, Mich.

In the Snake river basin are many old rhyolitic cones covered by lava flows of later origin. The extent and thickness of the Snake river lava and its relation to the Columbia river lava were discussed. There is a decided lack of evidence of fissure eruption in the Snake river area. The distinction between the cinder and lava cones was illustrated, and various types of lava from the flows were shown.

The characteristic ridges on the older lava streams are due to basal compression of folds on the surface of the stream, these folds sometimes being hollow at the top, though compressed below. Lantern views and specimens illustrated these features. Along cracks in the lava streams, parasitic cones are built up and these and numerous other characters of the lava stream were illustrated by lantern views. Where the lava stream has come in contact with a body of water, the base of the sheet expands and becomes cellular, although the character of the lava is glassy from rapid cooling. The sand of the lake or river bottoms into which the lava stream entered is often cemented into the base of the sheet, and gives it a white color.

The canyon of Snake river owes its peculiarities to many of the features discussed. Shoshone falls are due to a cone or mass of hard rhyolite beneath the basalt, discovered by the river. Heavy lava sheets overlie the finely stratified, unconsolidated lake beds exposed in the canyon, which are scarcely altered by the lava. The base of the latter is glassy, with a few steam holes, but at a short distance above, the sheet has its normal granular character. From beneath the lava stream or from a porous layer, numerous powerful springs issue along the side of the canyon below Shoshone falls. These may be called 'canyon springs,' a new term introduced in the classification of springs. In the northern wall of the canyon occur remarkable spring-formed alcoves or side canyons, which widen out amphitheater-like, and have no stream at their head. Powerful springs, issuing from the fine lacustrine beds underlying the lava, undermine the latter and cause recession of the walls. Numerous lantern views were used in illustration of the paper.

Professor Emerson discussed the origin of these lava beds and their surface characters. He pointed out the similarity of many features of these lavas to those of the Hawaiian volcanoes. He compared the base of the Snake river lava, resting on fine lake beds, with that of the Triassic trap of the Connecticut Valley, resting on the Triassic sands.

Professor Wolff discussed the age of the lava flows and cones.

Structure of the Front Range, Northern Rocky Mountains, Montana: Bailey Willis, Washington, D. C.

The Front Range of the northern Rockies consists of a series of limestones, quartzites and silicious argillites somewhat exceeding 9,000 feet in thickness, and gently flexed in a synclinal form. The width of the range is approximately twenty miles from foothill to foothill, and the synclinal structure has practically a corresponding extent. The trend of the range is from northwest to southeast, and the strike of the rocks is essentially parallel to it. The mass is, however, not exactly symmetrical in cross section, the rocks outcropping on the northeastern side comprising probably 3,000 feet of strata lower in the series than the lowest on the western side.

Approached from the east, the margin of this synclinal mass is found to rest discordantly upon black clays and sandstones. These strata appear at some little distance from the range in the Great Plains, dipping deeply southwestward, but where they pass beneath the great limestone and quartzite series they correspond very nearly in attitude with the overlying rocks. The relation of the overlying to the underlying series is, however, that of an overthrust mass. In many places the black shales and sandstones were found to contain Inoceramus and Ostrea characteristic of the Cretaceous. In the overlying rocks Mr. Weller fortunately found fragments of

fossils which have been determined by Mr. Walcott as identical with those discovered by him in the pre-Cambrian Belt formation. Thus the discordance corresponds to an hiatus of all of the Paleozoic and part of the Mesozoic. The plane of overthrust dips gently to the southwest, and is exposed at right angles to its strike throughout a section seven miles in length, which is equivalent to a displacement of that amount. There are interesting details of structure in the overthrust and underthrust masses.

On the western side of the range parallel to the valley of the North Fork of the Flat Head the ancient limestones and quartzites present a bold face, and the stratigraphic relations of rocks found west of the Flat Head valley indicate that this face is a deeply eroded fault scarp of the normal type. The valley of the North Fork of the Flat Head contains lake beds, which are by analogy with similar formations in Montana tentatively referred to the Miocene or Pliocene.

From these data it is inferred that the structural history of the range comprises:

First. Deposition of Cretaceous sediments of very considerable thickness adjacent to a shore not far from the present site of the range and upon a land whose surface consisted of the pre-Cambrian limestones and quartzites.

Second. That in some post-Cretaceous epoch compressive strains resulted in a fold overturned toward the northeast, and ultimately in the development of a corresponding overthrust fault.

Third. That at some later date, probably Miocene, normal faulting resulted in relative uplift of the mass of the front range and downthrow of the mass of the Flat Head valley.

The next paper was a continuation and illustration of the preceding one, numerous lantern views being shown:

Physiography of the Northern Rocky Mountains: BAILEY WILLIS, Washington, D. C.

Professor Coleman discussed the physiography and origin of the structure of the region to the north of that described by Bailey Willis. Professor Davis discussed the structure and physiography of the region described. Mr. Walcott compared the section of pre-Cambrian rocks of the Belt Mountain terrane with that given by Willis in the Northern Rockies, and considered the probability that the entire series involved in the front range is Algonkian.

The Walls of the Colorado Canyon: W. M. DAVIS, Cambridge, Mass.

The general profile of the canyon walls depends on rock structure, and not on a pause in the elevation of the plateaus. The variation of profile from the narrow canyon in the Uinkaret plateau to the wide canyon in the eastern Kaibab is due to variation in the character of the strata. The pattern of spurs and recesses varies with the stage of dissection. The pattern commonly seen in the Red-wall cliffs is repeated in the Tonto cliffs where the latter are much worn. The pattern usually seen in the Tonto is repeated in the Red-wall where it is less worn. Brief mention was made of details connected with the unconformities seen in the canyon walls.

The paper was illustrated by lantern views, and was briefly discussed by Mr. Walcott and others.

The Society then adjourned for the noon recess.

The papers of the afternoon session were:

Rock Basins at the Helen Mine, Michipicoton: A. P. COLEMAN, Toronto, Canada.

Two small lakes or ponds, each a quarter of a mile long and two-thirds as wide, just west of the Helen iron mine near

Michipicoton on the north shore of Lake Superior, present very interesting examples of rock basins. Unlike most of the smaller rock basin lakes of Canada, they are not of glacial origin and probably were not even scoured out by the ice, since they are narrowly enclosed by steep, rocky ridges rising about 150 feet to the north and south and 450 feet toward the east. The shape of the valley is somewhat like that of an armchair with its back to the east, the two ponds, called Boyer and Sayers lakes, occupying the narrow seat. They had a depth of from 125 to 150 feet in the beginning, but Boyer lake, the higher one, is now partially pumped out to facilitate mining operations. From Boyer to Sayers lake the fall is 25 feet; and from Sayers to Talbot lake, which is beyond the high rock walls of the valley, there is a drop of 75 feet.

The valley of the two ponds is cut from rocks belonging to the iron range, chiefly siderite and granular silica banded with magnetite or heavily charged with pyrite, and the lowest point of the rim of each consists of silicious siderite containing much pyrite. The side walls of the valley are of greenish schists. The hollowing of the basins must have been due to solution, perhaps of parts of the iron range rocks which had been shattered; and the deposit of the large ore body at the eastern end of Boyer lake, where a high hill, consisting largely of impure siderite, drops steeply down to the basin, probably has a bearing on their formation, the decomposition of pyrite perhaps furnishing the solvent.

The next paper was:

The Effect of the Shore Line on Waves: W. M. Davis, Cambridge, Mass.

The paper was a statement of the transformations of waves as they run in upon shore lines of different forms, with special reference to the refraction of waves on headlands and in bays, and to the formation of surf.

The breaking of waves is not so much due to a retardation by friction of the base of the wave in shallow water, as generally assumed, as to the absence of water in front of the wave near the shore.

The next paper was:

Variation of Geothermal Gradient in Michigan: Alfred C. Lane, Lansing, Mich.

The geothermal gradient in Michigan appears to vary from 1° F. in 107 feet to 1° in 54 feet. Among the different causes of variation, the varying diffusivity of the rocks appears to be important.

Diffusivity varies with the density; the more porous the rock, the smaller the diffusivity. The limestones of Cheboygan have a diffusivity paralleling that of the copper-bearing rocks of Kewenaw Point. The diffusivity of the shales of Michigan is widely at variance with that of the limestones.

The next two papers were presented together and illustrated by lantern views:

Origin and Distribution of the Loess in Northern China and Central Asia: George Frederick Wright, Oberlin, O.

Detailed observations in China, Mongolia, and Turkestan were presented which bear upon the fluvio-glacial theory of the origin of the loess of these regions, and of its distribution by wind or water.

No evidence of glaciation is found where Geikie and Krapotkin assumed it.

The Age of Lake Baikal: George Frederick Wright, Oberlin, Ohio.

The region about Lake Baikal is covered with strata of Tertiary (and possibly Triassic) age, containing coal. These beds are derived from the sediments which were carried by now existing streams into the basin from the surrounding mountains, before the present lake came into existence. At the

estimated rate of erosion the entire lake would be filled in 400,000 years, whereas it is not a quarter full, and probably not one tenth full. The age of Lake Baikal is perhaps 100,000 years or less. That this region was formerly connected with the sea is shown by the species of seal found in Lake Baikal, which are also found in the Caspian sea. Other evidence of recent submergence followed by reelevation exists. A period of increased precipitation caused the freshening of all the waters of the inland lakes of this region.

Professor Scott discussed the importance of æolean action in the formation of stratified beds, referring to those of Santa Cruz in Patagonia, in which vertebrate remains have been found finely preserved.

On Some Anticlinal Folds: T. C. HOPKINS and MARTIN SMALLWOOD, Syracuse, N. Y. Read by Professor Hopkins.

A number of unique folds occur in several small and rather deep ravines in the vicinity of Meadville, Pa. They are of limited extent both vertical and linear, and so far as known occur only in the bottom of the ravines. The relation of the folds to certain land-slip terraces, suggests a cause for these folds which are often asymmetrical.

Professor I. C. White referred to similar folds in other portions of Pennsylvania. He considered that gas formed below found an opportunity to escape in the relatively weak bottoms of canyons, causing an upward pushing of the strata. Professor Brigham mentioned the occurrence of similar folds in western New York. Professor Russell recalled folds, in the bottoms of canyons in western Idaho, where the strata are sharply arched. Land-slip terraces occur on both sides, there being thus no unequal pressure. He considered that the downward pressure of the wall rocks of the canyons, and the relief of pressure in the bottom, caused the arching. Professor Stevenson discussed other folds in Pennsylvania. Mr. C. J. Sarle mentioned folds in the Clinton beds at Rochester and other localities.

The following papers were then read by the author:

Distribution of the Internal Heat of the Earth: T. C. CHAMBERLIN, Chicago, Ill.

Has the Rate of Rotation of the Earth Changed Appreciably During Geological History? T. C. CHAMBERLIN, Chicago, Ill.

The papers were a discussion of the mathematical and physical principles involved, and the available experimental data. The geological application to the phenomena of volcanoes, mountain foldings, etc., and to the great questions of physical geology was discussed.

In discussion some remarks were made by Professor Coleman.

The Society then adjourned until the next day.

The annual dinner was served at eight o'clock at the Whitcomb House. President Walcott occupied the head of the table, which was graced by the presence of a number of ladies. The after-dinner speeches touched upon the future policy of the Society and other topics, and contributed largely to the enjoyment of the dinner, which was voted one of the best ever attended by those present.

Third day, Thursday, January 2, 1902. The Council met at 9 o'clock in Sibley Hall. The meeting of the Society was called to order at 10 o'clock, Vice-President Winchell in the chair. Professor Clarke asked for a statement from the secretary concerning the relation of the Society to Section E of the American Association, especially in regard to next winter's meeting in Washington.

The following papers were read:

Use of the terms Linden and Clifton Limestones in Tennessee Geology: Aug. F. Foerste, Dayton, Ohio.

The Lower Helderberg was named in Tennessee from its exposure at Linden, where it is but 12 feet thick, while the maximum thickness is between 75 and 100 feet. Foerste questioned the advisability of naming a formation from the place of its minimum exposure. Faunal and stratigraphic characteristics were given.

Bearing of the Clinton and Osgood Formations on the Age of the Cincinnati Anticline: A. F. Foerste, Dayton, Ohio.

In continuation of former studies the author developed his interpretation of the Cincinnati anticline. The Devonian axis of the anticline was northeast and southwest, while the present axis is north and south. The Clinton strata over the central portion of the anticline are coarse limesands with wave marks and crossbedding, and beds of conglomerates. North and south of this area, the material is a fine lime-mud. The relation of these features to those formerly described was discussed.

J. M. Clarke discussed the subdivision of the Lower Helderberg of Tennessee. The fauna has a Silurian facies. I. C. White called attention to the importance of the Clinton Iron Ore bed, and its extension in Maryland and Pennsylvania. Brief remarks were also made by H. M. Ami and B. K. Emerson.

Notes on the Catalogue of Types in the Geological Department of the American Museum of Natural History: E. O. Hovey, New York.

The paper was an exposition of the great work recently completed at the Museum in the cataloguing of the large number of types and figured specimens in the Museum, and of looking up references for each specimen. Complimentary remarks were made by J. M. Clarke, H. M. Ami, and others.

The New Carboniferous Age of the Union and Riverdale formations in Nova Scotia: H. M. Ami, Ottawa, Ont.

In Colchester county lower Carboniferous beds are thrust over the newer Union and Riverdale beds, which by their fossils are known to be middle Carboniferous. In Pictou county the Lower Carboniferous rest unconformably upon the upturned Eo-Devonian, with which the Union and Riverdale beds were formerly correlated by stratigraphers. The evidence of the overthrust is, however, complete. The Union and Riverdale beds of Nova Scotia are equivalent respectively to the Mispeck and Lancaster formations of New Brunswick.

Origin of the Faunas of the Marcellus Limestones of New York: John M. Clarke, Albany, N. Y.

The Marcellus fauna is characteristically a bituminous mud fauna. Two prominent limestone beds, the Goniatite and Stafford limestones, carry, the one an upper Onondaga fauna, and the other a lower Hamilton fauna. The former makes its appearance near the meridian of Rochester, and extends eastward, rising relatively higher and higher in the bituminous shales. The other ends at the same meridian and thickens westward. The fauna of the Goniatite limestone (fauna of *Agoniatites expansus*) represents an eastward migration of the upper Onondaga fauna, which had persisted in the west, while the bituminous mud fauna had already become established in the east. The Stafford limestone fauna is a prenuncial Hamilton fauna, which persisted for a time and then was overwhelmed again. The Onondaga and Hamilton faunas appear to have come from the northwest, while the bituminous mud fauna of the typical Marcellus shales came from the southwest.

In discussion, brief remarks were made by I. C. White, A. P. Brigham and A. W. Grabau.

In the absence of the authors the following papers were read by title:

Notes on Mts. Hood and Adams and their Glaciers: H. F. REID.

Keewatin and Laurentide Ice Sheets in Minnesota: A. H. ELFTMAN.

Devonian Interval in the Ozarks: C. R. KEYES.

Devonian Fish-Fauna of Iowa: C. R. EASTMAN.

Geological Section in Northern Alaska, along the 152d Meridian: FRANK C. SCHRADER.

Notes on the Geology of Southeastern Alaska: ALFRED H. BROOKS.

Geology of the Virgilina Copper District in Virginia and North Carolina: THOMAS L. WATSON.

Cuttyhunk Island: F. P. GULLIVER.

The Mohokea caldera on Hawaii: C. H. HITCHCOCK.

A resolution of thanks to the president and trustees of the University of Rochester and to the professor of geology, the secretary of the Society, was offered by Professor Emerson, and after some remarks by Professor Coleman was unanimously adopted. After some closing remarks by the vice-president, the Society adjourned until December, 1902.

A large proportion of the fellows remained in Rochester to attend the evening reception given by President and Mrs. Rush Rhees, of the University of Rochester. The afternoon was devoted to short excursions to the Genesee gorge and other localities about Rochester, and to an inspection of the establishments of Ward's Natural Science Bureau, the Bausch and Lomb Optical Company, etc.

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FORESTRY IN NEW YORK STATE.

THE New York State School of Forestry, located at the New York Land Grant College, with its laboratories in the form of trained man in this department in the Adirondacks, is discovering that the difficulties which have attended so generally the promotion of pure science in our colleges and schools, during the past generation and earlier, are not necessarily evaded or lessened when the question becomes one of promotion of applied science and the utilization of scientific method directly in the promotion of the highest interests of the State and of its people.

New York was the first of the States of the Union to provide, on a suitable working scale, for the introduction of the art of forestry into this country by systematic and scientific instruction in a technical college, purely and professionally devoted to that work. It established the 'College of Forestry' as a department of the State college, Cornell University, authorized the purchase of a large tract of forested land, gave directions that the work should be done under the supervision of an expert, scientific and practically trained forester, and conferred ample authority upon the College of Forestry, its director and the university board of trustees, to establish and permanently sustain the college and its work. The primary purpose of the college was the education of professionally trained foresters. This provision was made in 1898 and was at once put into operation. Land was purchased—outside the State Reservation and thus not subject to the constitutional limitations affecting that reservation—and work promptly begun.

Hardly had this long-needed and immensely important enterprise been inaugurated by the appointment of Director Fernow, the most experienced, professionally trained man in this department in the country, and the schedule of work and

study and laboratory practice determined upon than an opposition arose, on the part of interested and ignorant persons, that was as well organized and as savage as any attack upon Cornell University in its earlier days of *Sturm und Drang*. The management was accused of seeking to make the Adirondack tracts 'as barren as the top of Mount March,' of 'methods under which everything in the shape of wood, right down to shrubs, is being sold and cut,' of infringing upon the State preserve and the State Constitution. It was asserted that 'the land is being stripped as clean as ever it would be stripped by wood-pulp men, * * * cleared of everything but brush,' that one company is taking all the soft wood and another is 'taking the rest of the growth, right down to saplings'; and numberless other equally false and foolish tales reinforced the bill of complaint.

To this curious and unintelligent assault it became necessary to reply, as the newspapers had taken it seriously in many instances and a hue and cry was being raised which might very probably do much injury to the new enterprise, to the best interests of the State and to the reputation of the university and the college. Director Fernow has prepared an open letter regarding the matter from which we abstract the following:

The introduction in the United States of forestry methods in managing forest properties has been delayed by just such misconceptions, misstatements and misdirected attacks as characterize the lucubrations lately published in various newspapers regarding the doings of the College of Forestry in the Adirondacks.

THE SITUATION.

Cornell University was, by the State, invited to establish a College of Forestry, in which professional foresters were to be educated, and at the same time there was given to it, as an experiment station in charge of the College of Forestry, a tract of land in the Adirondacks, from which the lumbermen had culled the pine and spruce. On this tract it was to show how such a culled hardwood forest might be managed under forestry principles.

The College of Forestry does *not* control the State forest reserve, has not even a voice in its management, nor is it operating on any State lands, the tract at its disposal having been deeded directly from the owners to Cornell University. While it would have a perfect right to cut the timber down to saplings, it does *not* do so, for good reasons.

WHAT IS FORESTRY?

Forestry, in simplest terms, means no more nor less with reference to wood crops than agriculture means with reference to food crops. It is a business which is concerned in the production of useful material, the most important and most widely used material, next to food materials. It is, then, entirely utilitarian. It is not concerned, at least directly, with the beauty of trees or with the shelter for game, although these aspects may be incidentally looked after. Also incidentally and more prominently must the influence of a forest cover on soil and water conditions be kept in view. This latter interest is directly important to the forester himself, since he must keep his ground in satisfactory productive condition, if he expects to be successful with his crop. The forester, then, looks on the forest as a crop and that involves *reaping as well as planting*.

THE FORESTER A HARVESTER.

He is a logger as well as a sower; he uses the axe as well as the spade and dibble. He uses the axe even more than the planting tools, for under certain conditions he

may, by judicious management in the cutting of the old crop, secure the new crop by the seeds falling from the old trees before he removes them.

This is the difference between the lumberman and the forester. The lumberman simply reaps nature's product, takes the best trees, the best cuts, and leaves the rest in possession of the soil for nature to do with it as it pleases, either to let it grow up to weeds and brush or to recover the soil, in due time reproducing another crop. The forester has the obligation, when he reaps, to provide *systematically* for a new crop; not the chance volunteer crop of nature, but one of economic value, of species that are most useful, in larger quantity and better form and in shorter time than nature, unaided, could or would produce.

If the College of Forestry were only logging its tract as the lumberman does, it would, indeed, be remiss in doing its duty.

If the college were only doing what is proposed to be done on certain parts of the State Forest Reserve, namely, to cull out the valuable spruce and leave the hardwoods altogether, it would still be remiss in its duty, for while, to be sure, the charge of denuding the land could not be brought, there would not be any good forestry practice in merely reducing the most valuable part of the crop and its chances of reproduction.

REPRODUCTION THE KEY-NOTE OF FORESTRY.

The forester may not harvest his crop without systematically providing for reproduction, replacing the harvested crop by a crop, if possible, superior in composition. This can be accomplished in more than one way, and the choice of method depends on many considerations which have reference not only to the condition in which the forest manager finds the forest property that he is to manage, but also to the condition of the finances which are to back him in this business of forest cropping.

Where the lumberman has culled the desirable kinds and left the inferior, or comparatively less valuable ones, in possession of the soil, as is the case in most parts of the college tract, it stands to reason that, if the former are to be reestablished, it can only be done by reducing the latter and replanting artificially those we would wish to be most prominent in our new crop. Where the desirable kinds are still present, a new crop may be reproduced from the seeds of these, gradually removing the old trees as the young crop needs light. The College of Forestry proposes to use both methods, separately and in combination, taking advantage of any volunteer growth present, and leaving the volunteer growth of young saplings of hardwoods, conifers and older seed trees where desirable, and planting in pines and spruces to fill up the natural reproduction.

FOREST PRESERVATION BY REPRODUCTION.

The operations of the college last year extended over an area of less than 500 acres, of which it is estimated about 300 need planting. Owing to the unfavorable winter, operations were delayed, so that planting ground could be made ready only to the extent of 105 acres, which were planted. The nurseries established contain now material sufficient to plant 500 acres next spring, if the means for doing this planting can be had. Burnt and waste lands have also been planted, so that some 225 acres are now planted. In fact, counting by numbers, the college has, so far, planted 100 trees for every four trees cut. These are as many as its scanty resources permitted. It is, therefore, following the main precept of forestry to reproduce the crop. The charge that it is cutting down to mere saplings is truly puerile, for, while there would be no impropriety in doing

this, provided the crop were properly replaced, there is no market for such saplings. The story comes probably from the observation that small brushwood of the felled trees has been cut and bundled as an experiment, to see whether it could not be made useful.

THOROUGH UTILIZATION.

The lumberman, it is well known, cuts and utilizes only the logs, and those of the best trees and kinds, leaving a large part of the trees he has felled on the ground as *debris,* to feed the fires and prevent young growth. The forester is forced, by the mandates of his business, to utilize as much as possible not only the poor trees, but all that is in a tree; not only the logs of the best, but of the weed trees as well, and the cordwood and the brush, if he can; or else he may have to burn the brush later. Thorough utilization, instead of the wasteful one which the mere logger practices, distinguishes the forester's work. Unfortunately, there is no market for this inferior material, which a satisfactory silviculture requires to have removed. The College of Forestry is at least trying to satisfy, as far as possible, this requirement.

WHERE THE PROFITS GO.

The charge that the logging operations are carried on for the financial benefit of Cornell University is even more puerile, for, if there were any profits to be derived from the sale of the crop, the State has carefully guarded against having them applied for any other purpose than the one in hand, namely, the running of this demonstration or experiment station and the replacement of the crop. It is absolutely impossible for Cornell University to make any profits from the College Forest, since all returns are at once turned over to the State Treasurer for the purpose aforesaid. As a matter of fact, the finances of the college experiment station are not such as to make anyone who knows them envious. Much more work in planting and improvement generally would have been done if finances permitted; that is, if the State had appropriated a more liberal working fund, such as had been asked for. Any business man knows that a certain working capital is required to carry on a given business; if this is below a certain figure, the business can only be carried on in a lame way and at a disadvantage.

INSUFFICIENT FUNDS.

This is the condition of the College Forest management; it is trying with an insufficient capital to earn what is necessary to pay for the administration and the improvements, including planting. A lumberman, logging these hardwoods, would find it difficult to make a satisfactory margin; a forester, who is obliged to log with more care and to replace the crop he has cut, necessarily works under greater financial disadvantages, and, so far, it has only been possible with great economy and care of the finances to secure any margin which can be applied to the forestry work.

The wise policy for the State, if it wished this experiment in forest management properly carried on, would have been either to make provision for annual appropriations for its conduct or to provide a sufficient working fund on which to run the experiment as a business. In my last annual report I stated that the modest fund of $50,000 was asked, but only $30,000 was allowed, which would hardly suffice to carry on a logging operation. To place the experiment on a proper basis, to permit the development of means of transportation from all parts of the property, which alone would make possible the method of gradual removal and reproduction by natural means, a working capital of not less than $150,000 should be placed at the disposal of the management.

WHO ARE THE OBJECTORS?

It remains, then, to state that the College of Forestry is doing what it is set to do. It is harvesting from an area from which the valuable part has been already removed, the old, decrepit hardwood crop which is rotting and becoming less and less valuable, and is replacing it by a young, vigorous crop of better composition. It is doing this by trying to make the old crop pay for the new; that is, carrying on the experiment like a business venture.

It may be of interest to inquire whence the opposition to its procedure comes.

There are those who have used this property as a hunting ground, and naturally desire to preserve it as such for their own personal benefit. They are opposed to the change from old timber to young plantation, which only in years will again give them a hunting ground.

Again, there are those sentimentalists who consider it a sin to cut a tree, overlooking that their houses could not be built and their homes furnished without the utilization of the forest.

There are those who mistake the situation and think it is the State's Forest Reserve that is being cut over. Moreover, as they have made up their minds that forest preservation is only to be had from non-use, the forest preservation practiced by the college, which lies in the philosophy that all life is efficiently preserved only by reproduction, does not appeal to them.

There may also be those who know only one way of treating a forest, and hence, differing as doctors do, criticise the method of artificial reproduction by planting, which the college is in part forced, in part has chosen, to follow. These recognize only the culling process, which the lumberman has practiced with the softwoods, as legitimate; and advocate even that the State practice it in the Forest Reserve on its virgin lands, and cull out the valuable spruce in order to make the reserve of financial use.

While, no doubt, the gradual removal system has some advantages, if properly applied, it means, when applied to hardwoods, which cannot be transported by water, the development of an extensive system of railroad transportation, which requires funds such as the college has not had at its disposal.

NO FEAR FOR THE PRESERVE.

The college is doing what it can do, under the circumstances surrounding the problem, on practical business lines. It was set to doing a definite, limited task. It has no control of, no voice in, no relation to, the management of the State Forest Preserve, and would not, if it had, advocate the application of its methods to the State Preserve. For the objects of the State Preserve are entirely different from those which the college tract is to serve, and hence what is proper to do on an area set aside for demonstration is by no means proper to do or directly applicable on an area set aside primarily for soil protection and recreation.

Hence no fear need be entertained that the State Preserve is in danger of being denuded through the agency of the college. On the contrary, the college hopes to influence the management of the Adirondack Preserve in the very opposite direction. It hopes that its success in reforesting burnt and waste areas will stimulate the State authorities to do likewise. This fall the college presented to the Forest, Fish and Game Commission several thousand pine and spruce seedlings, which were planted by an agent of the Commission and by interested landholders in the Catskill Reserve.

As a result of this first beginning the Forest Commission has just contracted with the College of Forestry for 420,000

conifer seedlings to be furnished from the nurseries of the College Forest and to be planted on waste areas in the Adirondack Preserve.

Dr. Fernow's explanation should suffice not only to convince the intelligent but misled reader of the shameful attack against which he protests—and which, we observe, was telegraphed from Watertown—but even to instruct the most ignorant and thoughtless, if not to silence the selfish, obstructors of a policy which has commenced none too soon its endeavor to remedy the apparently irretrievable and fatal mischief which has done so much to bring upon the State and the nation all the grievous results of deforestation. This is one of those matters of applied science which is of such overwhelming importance as to justify the nation in making any sacrifice of time and money, the State in meeting every minutest requirement of its Forester and the people in silencing promptly and effectively every unpatriotic citizen who seeks to make the highest interests of the State subservient to his own individual petty desires.

FIELD WORK OF THE ETHNOLOGICAL DIVISION OF THE AMERICAN MUSEUM OF NATURAL HISTORY IN 1901.

In the past year the principal part of the field work of the Jesup North Pacific Expedition, which was organized in 1897, has been brought to a close. Parties were in the field in the interior of British Columbia, on Vancouver Island, on Queen Charlotte Islands, and in northeastern Siberia. Mr. James Teit continued his studies and collections among the Thompson Indians and their neighbors. Mr. George Hunt was at work in northern Vancouver Island.

The principal undertaking of the expedition on the Pacific coast of America was a thorough investigation of the Haida Indians of Queen Charlotte Islands, which was intrusted to Dr. John R. Swanton. Dr. Swanton went to Queen Charlotte Islands in September, 1900, and stayed among the Haida for more than a year. His work was eminently successful. He succeeded in unravelling the intricate social organization of the tribe, and in giving, for the first time, thoroughly satisfactory explanations of the significance of totem poles. He also collected much information on the customs and beliefs of the people, and brought back an immense mass of mythology, recorded in both dialects of the native language, as well as grammatical notes sufficient to give a clear insight into its structure.

Unfortunately the interesting art of the Indians of Queen Charlotte Islands has practically disappeared. The raids of collectors such as Swan, Jacobsen, not to mention the later inroads of traders and other collectors, have been such that hardly an article of the old objects of this tribe is left. This condition hampered Dr. Swanton very considerably, in so far as it made his work of obtaining interpretations and explanations of objects impossible. Although he took with him a large number of sketches and photographs of masks, rattles and other objects of Haida provenience, it was found almost impossible to obtain explanations for any of these, because the owners and users of these objects either were dead or could not be found.

The Siberian department of the expedition was in charge of Mr. Waldemar Jochelson. The party consisted of Mr. and Mrs. Jochelson, Mr. and Mrs. Bogoras, and Mr. Alexander Axelrod. The party was accompanied by Mr. Buxton, who was in charge of the zoological work. The expedition took the field in the spring of 1900. Mr. and Mrs. Bogoras, Mr. Axelrod and Mr. Buxton returned a few weeks ago,

while Mr. and Mrs. Jochelson will continue their researches until the summer of 1902.

Mr. Jochelson investigated the Koryak and Lamut. In the fall of 1901 he crossed the Stanovoi Mountains, and is at present engaged in researches among the Yukaghir, among whom he is continuing work previously undertaken by him among the western branch of this tribe. From here he is going to proceed westward, and will spend a considerable time among the Yakut. Mr. Jochelson reports that the culture of the Koryak has many features in common with the culture of the Indians of the north Pacific coast. Particularly is the mythology and folk-lore of these Siberian tribes and of the northwestern American Indians very much alike. Their arts are in some respects related to the arts of the tribes of southeastern and central Siberia, while in other respects there are strong resemblances to the Eskimo of Alaska. At the present time the natives of northeastern Siberia do not make any pottery; but Mr. Jochelson reports that remains of pottery were found in prehistoric sites. He collected very thorough information on the ethnology and physical characteristics of the tribe among whom he was working. The collection made by Mr. Jochelson among the Koryak has reached the Museum, and will be exhibited at an early date.

Mr. Waldemar Bogoras studied the Chukchee, Eskimo and Kamtchadal tribes. His previous studies among the Chukchee enabled him to make a thorough investigation of the languages of this district. He finds the Kamtchadal and Chukchee to be closely related languages. He has collected a large number of mythological and shamanistic texts, and much information of ethnological value. He reports that his collections are very extensive.

The various field parties of the Jesup North Pacific Expedition that have been at work during the last four years have accumulated information on all the important tribes between Columbia River in America and the Amur River in Asia. The work of the expedition has been planned in such a way as to cover the whole area as thoroughly as possible. Since Nelson made a thorough study of the Alaska Eskimo, and Lieutenant Emmons had accumulated a wealth of material on the Tlingit of Alaska, no work was undertaken among those two tribes. Ethnological investigations were made in the State of Washington by Livingston Farrand; in British Columbia by Franz Boas, Livingston Farrand, Roland B. Dixon, John R. Swanton, George Hunt and James Teit. This work covered the whole province, with the exception of the Athapascan tribes north and east of Chilcotin River. Archeological work in British Columbia and Washington was carried on by Harlan I. Smith. The work in Arctic Asia was described before; but, besides, investigations were made on the Amur River, where Berthold Laufer studied the Gold and the Gilyak, and where Gerard Fowke carried on archeological researches.

It would be premature to express an opinion, at the present time, in regard to the final results of a comparison of the material accumulated by the Jesup Expedition. It is, however, evident that the material collected proves early cultural relations between the tribes of northeastern Asia and northwestern America.

The results of the expedition are being published as rapidly as possible, in the form of monographic descriptions. Up to the present time the following have been published:

'Facial Paintings of the Indians of Northern British Columbia': FRANZ BOAS.

'The Mythology of the Bella Coola Indians': FRANZ BOAS.

'The Archeology of Lytton, British Columbia': HARLAN I. SMITH.

'The Thompson Indians of British Columbia': James Teit. Edited by Franz Boas.

'Basketry Designs of the Salish Indians': Livingston Farrand.

'Archeology of the Thompson River Region': Harlan I. Smith.

'Traditions of the Chilcotin Indians': Livingston Farrand.

'Cairns of British Columbia and Washington': Harlan I. Smith and Gerard Fowke.

'Traditions of the Quinault Indians': Livingston Farrand.

'Kwakiutl Texts': Franz Boas and George Hunt.

'The Decorative Art of the Amur Tribes': Berthold Laufer.

The manuscript for a number of additional monographs is completed, and others are in preparation. It is estimated, at the present time, that the results of the expedition will fill eight volumes of the Museum Memoirs.

The Museum is also carrying on work in China, which has been provided for by the generosity of a friend of the institution who desires his name to be withheld. This work has been placed in charge of Dr. Berthold Laufer, who went to China in July, 1901, and is carrying on work at the present time in the southern part of that country. The first part of the collection of Dr. Laufer has arrived at the Museum, and will soon be exhibited. The studies of an expert collector and investigator in that country cannot fail to give important scientific as well as practical results. Dr. Laufer's collections from China will be supplemented by collections made by Dr. C. C. Vinton in Korea.

Work has also been carried on in North America. In the beginning of the year Dr. A. L. Kroeber collected among the western Algonquin tribes. This work was in continuation of his work among the Arapaho, and has yielded much valuable material. Dr. Kroeber's investigations were directed principally to the study of the conventionalism of the western Algonquin tribes, and to their religious ceremonies. In both these lines he collected information of great scientific interest. This investigation was provided for by the liberality of Mrs. Morris K. Jesup.

In 1901 Dr. Roland B. Dixon returned from his investigations in northern California, which were supported by the late Mr. C. P. Huntington. Later in the year Dr. Dixon was engaged in the preparation of the scientific results of his inquiry, the publication of which has been provided for by Mr. Archer M. Huntington.

During the summer two investigators were sent out to carry on work among Indian tribes. Mr. William Jones spent four months among the Sac and Fox, and brought back with him much linguistic and ethnological information. Mr. H. H. St. Clair, 2d, studied the northwestern Shoshone. His investigations were partly of a linguistic character, partly ethnological. He directed his attention to the study of the conventionalism of this tribe.

The results of the studies of North American Indians, carried on by the Museum, are in progress of publication. The first volume of these researches is devoted to the Eskimo of Hudson Bay and Baffin Bay, and is in press. The first part of the descriptions of Dr. Dixon is also nearly completed. It is expected that in the coming year the results of Dr. Dixon's and Dr. Kroeber's work may be published.

SCIENTIFIC BOOKS.

Der Gesang der Vögel, seine anatomischen und biologischen Grundlagen. Von Dr. Valentin Häcker. Jena, Gustav Fischer. 1900. Gr. 8vo. Pp. viii+102. Mit 13 Abbild. im Text.

In the first chapter of this interesting brochure Dr. Häcker describes in detail the

anatomical structure of the vocal apparatus in birds, which, with the accompanying illustrations, gives a fair idea of the parts concerned and their functions. Chapter II. treats of the differences in the development of the vocal muscles in different groups of birds, and especially among different groups of song birds (Oscines), as well as of the differences in the vocal apparatus in the two sexes of the same species. In the female the parts are similar to those in the male, but much more feebly developed.

Chapter III. deals with the development of the song instinct, and discusses at some length the theories of Darwin, Wallace, Groos and others, and finally presents his own views on the subject, based in part on new material. The original call-notes, from which song has been developed, he believes were originally signal or recognition sounds, and that these have become specialized according to sex and as an aid to the male in attracting the female. He recognizes four stages or phases in the development of birds' calls and songs, namely: (1) A simple, uniform call, serving as a signal and recognition note for the species, developed by natural selection; (2) varied sexual calls or pairing calls, and (3) singing and warbling, or pairing songs, serving for the mutual attraction of the sexes, and developed through natural unconscious sexual selection; (4) summer, autumn and winter songs of Palæarctic birds, expressive of the ordinary emotions of the species ('allgemeine Wirkung auf die Psyche'), and due, at least in part, to natural selection.

Chapter IV. treats of other love-making demonstrations, as the 'clapping' of the stork, the 'drumming' of woodpeckers (forms of 'instrumental music'), the 'bleating' of snipe, song-flights, dances, display of color-marking and other ornamentation, etc., and of their relation to voice and song. In this connection the evolution of courtship or love-making is also considered.

Finally there is a convenient summary of the author's evidence and conclusions, the whole forming a highly original and suggestive treatment of a very interesting subject.

J. A. A.

Catalogue of the Lepidoptera Phalænæ in the British Museum. By SIR GEORGE F. HAMPSON, Bart. Vol. III., Arctiadæ (Arctianæ) and Agaristidæ. London. 1901.

This volume of 690 pages is published in the same style as Volume II. of this series, already noted in these pages. The Arctiadæ subfamily Arctianæ comprises 946 species from the entire world, of which 83 are here first described. Fifty new generic names are proposed. The small family Agaristidæ, which are, as the author rightly observes, an outgrowth of the Noctuidæ, comprises 225 species, of which eight are here first described. Eleven new generic names are proposed in this group. The author has made some orthographical changes. *Westwoodi, whiteleyi, kinkelini, blakei,* etc., appear in a scarcely recognizable guise as *vestvoodi, vhiteleyi, cincelini, blacei,* etc. But *loewi* on page 226 escaped, doubtless by inadvertence. We think these changes scarcely advisable. The woodcuts in the text and the volume of 19 colored plates accompanying the book are up to the author's usual standard, if not slightly superior to it, and add greatly to the usefulness of the work. Owing to the author's method of selecting the types of the older genera, his refusal to recognize some of the names proposed by Jacob Hübner, and to his ideas of the extent of genera, we find the familiar names of the North American species sadly changed. We hope to become accustomed to these changes; but it emphasizes the fact that the concept of the genus is very largely a personal one. With this in view I have catalogued the specimens in the National Museum by specific names, as being the more stable. We miss the genera *Cydosia, Doa, Cerathosia, Psychomorpha, Eupseudomorpha* (*Edwardsia* Neum.), *Eudryas* and *Ciris;* but these the author doubtless regards as Noctuidæ. We hope they will not fail to find place in the succeeding volumes, as seems to have happened to the genus *Pygoctnucha* with the species *harrisii* Bd., *funerea* Grt. and *robinsonii* Bd., and to *Ptychoglene coccinea* Hy. Edw., which do not appear in either Vol. II. or III., and certainly cannot come in the Noctuidæ which will follow. Our large and handsome Arctain, *Platyprepia virginalis* Bd., has been quite omitted. Equally

surprising is the absence of the familiar genus *Callimorpha* with its European and Asiatic species. If this genus belongs to the Noctuidæ by the author's classification, we think the scheme is some way at fault, for the insects are certainly Arctains in their broad characters. *Holomelina* (*Eubaphe*) *immaculata* Reak. has escaped notice, doubtless owing to Kirby's erroneous reference of it to the genus *Eudule* (Geometridæ). The species *Euhalesidota otho* Barnes, *Dodia albertæ* Dyar and *Pseudalypia geronimo* Barnes, appeared too late in description to be included. Most of these omissions are, we presume, intentional, but some seem due rather to the method by which the work has progressed, by which one family is completed before the critical study of the next one has been begun. Thus species which have been wrongly referred by cataloguers are liable to be overlooked. On page 79 *Bertholdia braziliensis* is described as new. The name must fall before *B. soror* Dyar (*Proc. Ent. Soc. Wash.*, IV., 391, May 3, 1901), which seems unquestionably the same species. On page 267 our author places *Spilosoma congrua* Walk. as a synonym of *Diacrisia virginica* Fab. We cannot agree to this, since it has been shown that a part of Walker's types were a distinct species, *antigone* Streck., and to this his description applies. *Arctia complicata* Walk. is made a synonym of *A. quenseli* Payk. We had always supposed it to be a form of *ornata*, which occurs in the same region (British Columbia), whereas *quenseli* is an Alpine form from the Alps, Labrador, White Mts., etc. But the author has Walker's type and should know. We shall be interested to see if *quenseli* can be found again in Vancouver Island.

Condensed descriptions of the larvæ of several species are given, but in a sporadic manner. Most of the life histories published within the last few years are included, but practically all the older ones published more than ten years ago are omitted. Doubtless it would have added greatly to the author's labors to have made a thorough search for all larval descriptions, but surely the North American species might have been included as they have been very completely catalogued in a bulletin issued by the U. S. National Museum in 1889. We do not, of course, desire to depreciate the value of this work, which, as we have before remarked, is a great boon to working entomologists, enabling us to identify our species far more readily than ever before. For, unlike many published synopses, Hampson's tables are practicable, not containing contradictions nor hair-splitting differences. Variation within specific limits may invalidate some of the characters which he uses, but we find this a very minor objection.

Harrison G. Dyar.

GAUPP'S ANATOMY OF THE FROG.*

This is not the first time that the present work has been noticed in this journal. The other parts as they have appeared have been reviewed as follows: Parts I. and II., Science, Vol. VII., p. 463; Part III., Science, Vol., X., p. 491.

The present part deals with the viscera, the next and concluding 'Heft' is to take up the integument and sense organs. The organs are discussed in the following order: Digestive tract, respiratory organs, thyroid gland, derivations of the pharyngeal region, urogenital organs, cloaca, and the cœlomic cavities. As with the portions of the work already published it is impossible with this to analyze the facts presented and to point out the features which are novel. Attention, however, must be called to the broadly morphological aspects of the work. Dr. Gaupp has given us not only the anatomy of the adult frog but has emphasized the bearings of the various structures. Thus at the beginning we have an account of the developmental history of the head-gut region without which the account of the derivatives of the branchial region would lose much of its interest. In the same way the urogenital structures are introduced by a longer account of their history. Then there is a valuable summary of what is known concerning hermaphroditism in the frogs. The illustrations throughout illustrate the frequent use of the

*A. Ecker's und R. Weidersheim's 'Anatomie des Frosches auf Grund eigener Untersuchungen durchaus neu bearbeitet,' von Dr. Ernst Gaupp. Dritte Abtheilung, erstes Hälfte. Lehre von den Eingeweiden. Braunschweig, Fr. Vieweg und Sohn. Pp. 438. 95 figures. Mk. 15.

color making them more readily intelligible, and the German is everywhere easy of comprehension.

In general terms we can say of this part, as of those which have previously appeared, that it maintains the highest standard of descriptive anatomical work, and when the treatise is completed we shall have in accessible form details of the structure of the frog only exceeded in anatomical literature by those relating to man. One can only wonder how a man, turning out so much research in other lines, can find time to produce such a monumental work as this. Not only has practically all of the existing literature been analyzed (the list of papers relating to the viscera includes 877 titles, some of course duplicate), but every point has been, as the title page says, 'neu bearbitet.' It is not possible to hope for a translation of such an extensive work, but the original must have a place in every biological laboratory in the country.

J. S. KINGSLEY.

A Laboratory Guide to the Study of Qualitative Analysis. By E. H. S. BAILEY, Ph.D., Professor of Chemistry, and HAMILTON P. CADY, A.B., Assistant Professor of Chemistry in the University of Kansas. Fourth edition. Philadelphia, P. Blakiston's Son & Co. 1901.

In the preface to this edition the authors say, "At the present time there seems to be an opportunity to broaden the methods of instruction in qualitative analytical chemistry, and to teach not only the facts and the mechanical methods of carrying out the various operations of analysis, but also to render them more intelligible and interesting to the student by a proper application of the theory of electrolytic dissociation and of the mass law. * * * The aim of the authors has been to produce a book which would enable the careful student to successfully carry on the work without the constant assistance of the instructor."

Several of the current manuals in their latest editions open with an introduction pointing out the significance of these theories for analysis, and in some the dissociation of the text has begun, as evinced by the furtive appearance of ions here and there throughout their pages.

The present authors are thorough; their introduction of twenty pages explains the theory of dissociation and the mass law, and the entire book is written in terms of ions; for example, "Antimony forms the positive antimonous Sb^{+++} ion, and the negative antimonite SbO_3^{---}, this antimonite, SbS_3^{---}, orthoantimonate, SbO_4 , this antimonate SbS_4^{---}, and antimonyl tartrate, $SbOC_4H_4O_6^-$ ions." Instead of acid or metal groups, we find groups of anions and cations.

The serious question is—are the operations of qualitative analysis rendered more intelligible to the student by this method? It seems to the reviewer that they are made more intelligible to an advanced student, but less intelligible to a beginner; but the authors intend this book for beginners.

For example the application of the phenomena of hydrolysis of salts of weak acids to the reactions occurring in the precipitation of basic salts is doubtless a help to a riper student. Again, while the following explanation of another reaction might be clear to an older student, might it not confuse a beginner? "If to a solution containing magnesium as ion, a solution containing hydroxyl ions in considerable concentration be added, a precipitate of magnesium hydroxid $Mg(OH)_2$, is produced. Ammonium hydroxid is a much weaker base than magnesium hydroxid, and consequently if an ammonium salt, such as ammonium chlorid, be added to a solution containing magnesium hydroxid, the hydroxyl ions from the latter will combine with the ammonium ions to form the slightly dissociated ammonium hydroxid, thereby decreasing the amount of the magnesium hydroxid in solution. Therefore the precipitate of magnesium hydroxid is readily dissolved on the addition of ammonium salts."

In connection with the clause quoted, it may be noted that in the separation of the groups Al, Cr, Fe—Co, Ni, Mn, Zn—Ba, Sr, Ca—Mg, the authors give directions with each group to add ammonium chloride if it is not already present, but give no reason for

the use of this reagent, excepting the one statement in separating Ba, Sr, Ca—from Mg, that 'advantage is taken of the fact that magnesium carbonate is not precipitated in the presence of ammonium salts and ammonium hydroxid.' Surely the common explanation of these group separations—the successive breaking down ammonium double-salts in order of their instability by the reagents ammonia, ammonium sulphide, ammonium carbonate and disodium phosphate—is better than no explanation. It may be objected that recent research has disproved, or at least rendered improbable, the existence in solutions of ions indicating ammonium double-salts. At all events, an explanation on the lines of the above quotation regarding magnesium ion might be given.

In brief, this book can be cordially recommended to those students who are trained from the start by lectures based on Ostwald's 'Grundlinien der anorganischen Chemie,' and are taught to look at chemical phenomena chiefly in the light afforded by the dissociation theory.

E. Renouf.

Laboratory Companion for Use with Thurston's Inorganic Chemistry. By W. A. Thurston, F.R.S., Lecturer on Chemistry in Clifton College, London, Edward Arnold. 1901. Pp. 110.

The author says in his preface that this little book is a reprint of most of the experiments in Part 1 of his 'Inorganic Chemistry' and is to be used only as a laboratory companion. It is intended to be used before the study of qualitative analysis is commenced, 'and may replace such work altogether in the case of those who leave school at an early age.'

Evidently it is impossible to criticise this book without a knowledge of the text-book which it accompanies. It is very different from American laboratory manuals. The author holds it 'most important that the connection between physics and chemistry should be insisted on from the earliest stages.' The first thirty-nine experiments are purely physical with exception of one on the hardness of water, which explains permanent and temporary hardness, and gives methods for determining the hardness of water; and this before a single experiment on chemical change has been made.

The experiments given in the remainder of the book are of more chemical nature, and are interesting, but seem to lack logical sequence; it is to be supposed, however, that this seeming fault would disappear if the book was used in connection with the author's lectures, and that we have in the book those experiments which he considers to be of particular theoretic or practical interest to young students. However, the book cannot be recommended as a manual in connection with the text-books in actual use in this country.

E. Renouf.

Chemical Lecture Experiments. By Francis Gano Benedict, Ph.D., Instructor in Chemistry in Wesleyan University. New York, The Macmillan Company. 1901.

This book of 435 pages contains brief, clear instructions for performing a great number of lecture experiments. The instructor who has little apparatus at his disposal and turns to Newth or Heumann for help in illustrating his lecture often finds it impossible to show the experiments described, for lack of apparatus. The author has rigorously excluded all costly apparatus, and has yet succeeded in giving so many brilliant and instructive experiments as practically to cover the whole course. This renders his book invaluable to instructors in schools and in the smaller colleges. But this is not all; any lecturer who glances through the book will find much that is new and striking. Especially is this true of the experiments on metals, which have received such scant attention in the earlier books. The reviewer has Dr. Benedict's book in use and finds it a valuable supplement to Newth and Heumann.

Edward Renouf.

GENERAL.

'The Fauna and Geography of the Maldive and Laccadive Archipelagoes, being the account of the work carried on and of the collections made by the expedition during the years 1899 and 1900,' is now in course of publication in 'Cambridge at the University Press.' Part I. of the first volume appeared

several months ago, and Part II., it is announced, 'will be published on April 15, 1902.' The work is edited by 'J. Stanley Gardiner, M.A., fellow of Gonville and Caius College and Balfour student of the University of Cambridge.' The part issued contains, besides the introduction, excellent reports on the physiography of the archipelagoes in question and on the Hymenoptera, Land Crustaceans and Nemerteans. The work will be more fully noticed when completed.

SCIENTIFIC JOURNALS AND ARTICLES.

THE *Journal of Comparative Neurology* for December. 1. Shinkishi Hatai, 'On the Mitosis in the Nerve Cells of the Cerebellar Cortex of Fœtal Cats,' shows: (1) The germinal cells of the nervous system of the fœtal cat present a modified form of the heterotypical mitosis of Flemming, (2) the number of the chromosomes represented by internodes of segmental filaments is 16, (3) all of the 'Halospindel' and a part of the central spindle are derived from the nucleolar substance, the central spindle containing the linin in great abundance. 2. Alice Hamilton, M.D., 'The Division of Differentiated Cells in the Central Nervous system of the White Rat.' The number and position of the dividing cells in later developmental stages (at and near birth) are described and compared with the results of other workers. Regarding the nature of the dividing cells, the author concludes: (1) There are at least two kinds of dividing cells in the central nervous system of the white rat, one small the other large, (2) neuroglia cells are derived from the small cells, nerve cells from the large ones, (3) dividing cells found in the gray matter and fiber tracts of the brain and cord are not indifferent cells, but are partly differentiated and it is possible to tell which are to become neuroglia cells and which nerve cells, (4) mitotic figures are occasionally found in multipolar nerve cells and in spongioblasts. 3. C. H. Turner, 'The Mushroom Bodies of the Crayfish and their Histological Environment.' A description of the supra-œsophageal ganglion of the crayfish, in the course of which it is shown that the mushroom bodies and the central bodies of the brains of crayfish and insects are homologous structures and that both of these organs are also present in worms. The first article is illustrated by one plate, the second by two, and the third by four.

PLANS have been made for a new engineering quarterly, which is to be known as the *Harvard Engineering Journal*. The first number, which will appear on March 1, will consist largely of a description of Pierce Hall, the new enginering building, and of the engineering department.

THE two journals devoted to geographical education that have hitherto existed in this country have been merged, and will appear, beginning with January, as the *Journal of Geography*, devoted to the advancement of geographical education. The new journal will be edited by Richard E. Dodge, professor of geography, Teachers College, Columbia University, and hitherto editor of the *Journal of School Geography;* Edward M. Lehnerts, professor of geography, State Normal School, Winona, Minn., and formerly editor of the *Bulletin* of the American Bureau of Geography, and Dr. J. Paul Goode, instructor in geography, University of Pennsylvania, Philadelphia, Pa. The *Journal of Geography* will appear ten times a year, with 480 pages to the volume. It will be 7 x 10 inches in size, and extensively illustrated. The editors will be aided by a large number of associate editors, representing different phases of geography. The journal will be published by the J. L. Hammett Co., Boston and New York, and will be printed at Lancaster, Pa.

SOCIETIES AND ACADEMIES.

AMERICAN MATHEMATICAL SOCIETY.

THE eighth annual meeting of the American Mathematical Society was held at Columbia University on Friday and Saturday, December 27–28, 1901. A single day's sessions no longer suffice for the extensive programs of the Society's more prominent meetings. In providing for a two-day meeting it was hoped to gain ample time for the presentation of papers, but the long program completely filled the four sessions. Fifty-nine members were in attendance, a number exceeding all

previous records. An enjoyable social feature of the meeting was the dinner at the Hotel Marlborough on Friday evening attended by fifty persons, including representatives of the American Physical Society, which was in session on Friday.

At the annual election, on Saturday morning, the following officers and members of the Council were chosen: Vice-Presidents, Maxime Bôcher, Frank Morley; Secretary, F. N. Cole; Treasurer, W. S. Dennett; Librarian, D. E. Smith; Committee of Publication, F. N. Cole, Alexander Ziwet, Frank Morley; Members of the Council to serve until December, 1904, Pomeroy Ladue, G. A. Miller, P. F. Smith, E. B. Van Vleck. The President of the Society, Professor E. H. Moore, holds office for a term of two years expiring at the annual meeting of 1902. Resolutions were adopted by the Council expressing appreciation of the services of the retiring Librarian, Professor Pomeroy Ladue, who has held that office since 1895.

The following persons were elected to membership in the Society: R. E. Allardice, Stanford University; Miss Grace Andrews, Columbia University; S. E. Brasefield, Michigan Agricultural College; W. E. Brooke, University of Minnesota; T. C. Esty, University of Rochester; L. L. Jackson, State Normal School, Brockport, N. Y. Seven applications for membership were received and laid over, under the by-laws, for action at the February meeting.

Reports were received from the secretary, treasurer and librarian. These reports will appear in the Society's Annual Register now in preparation. The Society has now 378 members, a net gain of 21 over last year. There are 17 life members. The total attendance of members at the meetings of 1901 was 230, the number of papers read 140, in both cases a large increase over previous years. The Treasurer's report shows a balance of over two thousand dollars. The *Transactions* has just initiated its third annual volume; the *Bulletin* has been issued since 1891. An especially important event of the past year was the deposit of the library of the Society in the charge of Columbia University, through whose generous action the books will now become available for the use of the members. A catalogue will soon be issued and steps will be taken to extend and complete the collection.

Following is a list of the papers read at the annual meeting. It may be added that the Chicago Section of the Society issued a preliminary program of nineteen papers for its meeting at Evanston, Ill., on January 2–3, 1902.

(1) 'Further types of unicursal sextic scrolls,' by Virgil Snyder.

(2) 'On the nature and use of the functions employed in the recognition of quadratic residues,' by Emory McClintock.

(3) 'A theorem concerning the method of least squares,' by Harold Jacoby.

(4) 'The theory of maxima and minima in n variables,' by Harold Jacoby.

(5) 'Recent researches in the theory of screws,' by Sir R. S. Ball.

(6) 'On surfaces whose geodetic lines are represented by curves of the second degree when represented conformably upon the plane,' by H. F. Stecker.

(7) 'A recent method for treating the intersection of plane curves,' by C. A. Scott.

(8) 'Two principles in the theory of multiple forms,' by Edward Kasner.

(9) 'On the invariants of a homogeneous quadratic differential equation of the second order,' by D. R. Curtiss.

(10) 'Some applications of the theory of assemblages,' by Arnold Emch.

(11) 'On a method for constructing all the groups of order p^m,' by G. A. Miller.

(12) 'Note on the transformation of a group into its canonical form,' by S. E. Slocum.

(13) 'On the characteristics of differential equations,' by E. R. Hedrick.

(14) 'On the circuits of plane curves,' by C. A. Scott.

(15) 'On the plane quartic curve,' by F. Morley and A. B. Coble.

(16) ' On the real solutions of systems of two homogeneous linear differential equations of the first order,' by Maxime Bôcher.

(17) 'The projective axioms of geometry,' by E. H. Moore.

(18) 'Remarks on the sufficient conditions in the calculus of variations,' by E. R. Hedrick.

(19) 'Note on isotropic congruences,' by L. P. Eisenhart.

(20) 'Lines of length zero on surfaces,' by L. P. Eisenhart.

(21) 'Concerning the class of a group of order p^m that contains an operator of order p^{m-2} or p^{m-3}, p being a prime,' by W. B. Fite.

(22) 'A characteristic property of the parabolic curve of nth order,' by Edward Kasner.

(23) 'On the content or measure of assemblages of points,' by Carl Gunderson.

(24) 'On the holomorphisms of a group,' by J. W. Young.

(25) 'On the resolution of orthogonal transformations,' by P. F. Smith.

(26) 'Proof that the group of an irreducible linear differential equation is transitive,' by Saul Epsteen.

(27) 'On the uniform convergence of Fourier's series,' by W. B. Ford.

The next meeting of the Society will be held in New York City on February 22. The Chicago Section will meet at the University of Chicago in April.

F. N. COLE,
Secretary.

COLUMBIA UNIVERSITY.

THE ACADEMY OF SCIENCE OF ST. LOUIS.

AT the meeting of the Academy of Science of St. Louis on the evening of December 16, the Nominating Committee reported a list of candidates for the offices of the Academy for the year 1902.

A paper by K. K. MacKenzie and B. F. Bush, entitled, 'The Lespedezas of Missouri,' was presented by title.

Professor F. L. Solden delivered an address on the advance made in education during the nineteenth century, stating that the most characteristic feature of the century's progress lay in the epoch of expansion and organization which it marked. The influence of Pestalozzi, Froebel, Horace Mann, William T. Harris and other distinguished educators was traced, the marked change in opinion concerning the commercial value of education brought out by the Centennial exposition of 1876 was indicated, and the establishment of a true university grade in this country with the opening of the Johns Hopkins University, the year following, was commented on.

Professor F. E. Nipher stated that he had continued his experiments on the production of ether disturbances by explosions, and by the motion of masses of matter. He had apparently succeeded in eliminating the effects of the shock of the air-wave upon the magnet needle. The needle is adjusted to a condition approaching maximum sensitiveness. There is no iron about the apparatus, except what is contained in the needle and in the compensating magnets. The latter are clamped in place so that the structure on which they are mounted may be pounded by a mallet without disturbing the needle. Rowland effects due to convection of electrified particles have also been eliminated. There remains a marked deflection of the needle, seeming to indicate that an ether distortion or wave originates in a sharp or violent explosion. This result is so amazing that it is announced with the statement that the whole subject is yet under the most searching examination. The coherer and the receiver of the telephone are to be used in two wholly different plans of experiment, in one of which the effects along the entire track of a leaden bullet are to be summed up in an alternating current. The results which seem to have been reached are in entire harmony with the well-known experiment of Michelson and Morley, who found that the ether within the building in which they worked was being carried along with the building and with the earth in its orbital motion.

WILLIAM TRELEASE,
Recording Secretary.

NORTH CAROLINA SECTION OF THE AMERICAN CHEMICAL SOCIETY.

THE fall meeting of the North Carolina Section was held on Saturday, November 23, 1901, at 11 a. m., in the office of the State Chemist, Agricultural Building, Raleigh, with presiding officer, W. A. Withers, in the chair. Eighteen (18) members and visitors participated in the meeting.

After the reading and adoption of the minutes of the previous meeting and the transaction of some minor miscellaneous business, the following program was presented and discussed:

'Notes on Instruction in Dyeing': G. S. Fraps.

The author gave a brief account of methods used and results obtained, in teaching dyeing at the North Carolina College of Agriculture and Mechanic Arts. Scrap books, which had been prepared by students, containing dyed samples and tests made on them were exhibited, to show the methods pursued.

'Systematic Acid Analysis': A. S. Wheeler.

The plan suggested by Abegg and Herz (*Zeit. für Anorg. Chem.*, 23, 236) is being tried with certain modifications with his classes in qualitative analysis in the University of North Carolina with considerable success. He finds it to be the nearest approach to a separation similar to that used with bases that he has cognizance of.

'Recent Work on the Phthaleins': Charles E. Brewer.

This was a review of the several articles that have recently appeared. The first of these was by Orndorff and Brewer on the constitution of gallein. The other three articles, in the current volume of the *Berichte* contributed by Liebermann, Thiele and Jaeger and Feuerstein and Dutoit, were on dioxyfluorescein or oxyhydroquinone phthalein. In every case the view that the phthaleins react as tautomeric compounds was sustained. All the contributors agree that those derivatives which have color should have given the quinoid structure, while those which are colorless are properly represented by the lactoid structure. A number of new compounds belonging to each of these two classes were reported.

'A Constant High-Temperature Bath': Charles Baskerville.

An ordinary enameled iron water-bath is made use of, surrounded by asbestos with a copper cover and a second asbestos top projecting in the bath and a wrought-iron float constructed to hold crucibles of various sizes. The liquid of the bath is composed of a mixture of the more fusible alloys. A specially constructed thermostat, made of very infusible glass, controls the flame of a large lamp. A glass tube, open at the bottom, penetrates the dual cover and is placed within one of the crucible receptacles. A mercury thermometer under 20 degrees atmospheric pressure is used.

'New Apparatus: (1) Soil Digestion Bath and (2) A Modified Condensing Bulb Tube for Nitrogen Determinations': C. B. Williams.

Drawings of these two pieces of apparatus, designed for use in the Chemical Laboratory of the North Carolina Department of Agriculture, were submitted; also, a description was read. Mr. Williams stated that these two pieces of apparatus had proved very helpful, both in point of economy of time and reliability.

'Nitrification of Ammonium Sulphate and Cotton-Seed Meal': W. A. Withers and G. S. Fraps.

The conclusions drawn by the authors from their pot experiments on nitrification are:

(*a*) Ammonium sulphate in some cases hinders nitrification.

(*b*) In nitrification of ammonium sulphate, sulphuric acid is produced and hinders the process unless neutralized.

(*c*) Soils differ in their action, depending upon the kinds of bacteria present.

(*d*) The relative number of organisms in the soil capable of nitrifying ammonium sulphate may be increased by continued addition of the substance and lime if such germs were originally present.

(*e*) Calcium carbonate is very helpful in nitrification.

Charles Burgess Williams,
Secretary.

THE SECTION OF GEOLOGY AND MINERALOGY OF THE NEW YORK ACADEMY OF SCIENCES.

The Section met December 16, at 8:15 P. M.

Mr. D. W. Johnson gave a paper on 'Notes on the Geology of the Saline Basins of Central New Mexico.' He said that in the Antonio Sandoval Grant, near the center of the Territory of New Mexico, are noted saline deposits which have served as important sources of a very pure salt in past years. The character of these basins was discussed in some detail, and points concerning their historical interest briefly touched upon. The general geology of the central portion of the Territory was then briefly reviewed, while the local geology of the Antonio Sandoval Grant was presented more in detail. It was shown that the saline lakes occur in the Red Beds of Jura-triassic or Per-

mian age. These beds are separable, on lithological grounds, into three divisions, designated as the Red Series, the Chocolate Series, and the Vermillion Series. Lenticular deposits of salt and gypsum are frequently found at the top of the lower or Red Series, and evidence was produced to show that the Saline Basins under consideration occur at this horizon. The facts were noted that Triassic types have been described from some part of the Red Beds (presumably the upper), while a characteristic Permian fauna has been recently found near the base of the Red Series. In view of these facts, and since no horizon of marked transition other than the salt and gypsum deposits occurs, it was suggested that these deposits might possibly mark the boundary line between the Jura-triassic and Permian in central New Mexico.

Dr. D. S. Martin presented a paper entitled 'Some Geological Notes on the Neighborhood of Buffalo, N. Y., made in the Summer of 1901.' Dr. Martin did not claim any special novelty for the data presented, but judged that they might be of interest to any members not acquainted with that region. Dr. Martin first outlined roughly the distribution of the series from the Medina to the Corniferous Limestone, and then mentioned in detail certain special features. He particularly noted certain joint seams in the Niagara Limestone near Lockport, N. Y., which have been much eroded and decomposed, and which are now filled with a dark brown claylike material, containing numbers of half decayed modern land shells, such as *Helix albolabris*. He then described the series of rocks exposed in the quarries found on North Main street, Buffalo, which are the source of the famous *Eurypterus* specimens. This series extends from the Corniferous Limestone to the Saline series and is divisible into five members, known as the Corniferous Limestone, the Blue Limestone, the Bulkhead Rock, the Water Limestone, and the Salina. Dr. Martin particularly emphasized the contact between the Bullhead Rock and the overlying Blue Limestone, and noted the occurrence of a sandstone dike extending to the top of the Bullhead series.

Mr. A. J. Queneau, in a paper entitled 'The Grain of Igneous Rocks,' said that a general observation might be made in regard to intrusive dikes. Near the margin the rock is dense, often glassy without any appreciable grain, whereas the grain begins to grow coarse according to some definite law, progressively as the distance from the wall increases. The present paper is based on the study of the laws governing such increase. It appears that the loss of heat is of paramount importance.* The problem taken up is very analogous to the one presented by the cooling of a slab of finite thickness and of great length and depth with respect to the first dimension, viz., the thickness. The method followed rests on the *Théorie de la Chaleur* of Fourier, and on the general theory of cooling by Professor R. S. Woodward.† The following laws have been deducted: (1) The zone of varying grain will vary indirectly as the initial temperature. From this follows that (*a*) Platonic rocks very deeply seated will not present a zone of varying grain to any extent. (*b*) Rocks which come to rest at a temperature nearing their consolidation point will present a wide zone of varying grain. (2) The time of cooling, other conditions being the same, varies as the square of the thickness of the dike.‡ From this last law it is assumed that the size of the crystals vary as the square of their distances from the nearest margin; then the square root of their area, which can be measured, varies directly as the distances from the margin. Thus we have a simple law of easy application.

RICHARD E. DODGE,
Secretary pro tem.

BIOLOGICAL SOCIETY OF WASHINGTON.

THE 345th meeting was held on Saturday evening, December 14.

Mr. W. H. Holmes spoke on 'Finds of Fossil Remains and Indian Implements in a Spring at Afton, Indian Territory.' The spring was situated in a level country and the superficial strata consisted of four feet of sand overlying

* Alfred C. Lane, Geol. Surv. of Michigan, Vol. VI.

† *Annals of Mathematics*, Vol. III.

‡ Riemann, 'Partielle Differential Gleichungen.'

a gravel bed about sixteen feet in thickness. In the gravel at the bottom of the spring were found several hundred finely made flint arrow-heads and spear-points, such as were used by the buffalo-hunting tribes, flakers of deer antlers, bones of recent wolf, horse, bison and elk, and teeth and fragments of bone of fossil bison, horse, mammoth and mastodon, teeth of these latter being present in considerable numbers and in an excellent state of preservation. In the gravel all about were similar fossil remains, but somewhat widely scattered. It had been learned from an old Indian chief that the arrow heads and other implements were cast into the spring as offerings, but it was difficult to account for such large numbers of fossil teeth and broken bones and their mixture with those of recent animals. It was suggested by Mr. Gilbert in the discussion which followed Mr. Holmes' paper, that possibly these teeth were offerings also, having been gathered from time to time, as they might have been washed out, and cast into the spring.

W. A. Orton described 'The Wilt Disease of the Cow Pea and its Control,' stating that the disease was caused by the clogging of the water tubes by bacteria, and that it was very prevalent among all save one of the varieties of the cow pea. This variety, known as the Iron, was resistant to the wilt bacillus as well as to the nematode, causing root-knot; that it was thus doubly resistant was an additional reason for hoping that similar cases might be found among other plants.

Theo. Gill presented a paper, in conjunction with C. H. Townsend, on 'The Largest Deep-Sea Fish,' this being the species described in Science for December 13, under the name of *Macrias amissus*.

William Palmer gave 'A Study of Two Ghosts,' explaining the manner in which spectral appearances had been caused on two occasions. In one instance the shadow of a person had been thrown on a cloud of mist by a light shining through a window of an adjacent house, and in the other a similar shadow had been cast on a passing dust cloud by an electric light. The disappearance of the mist and of the dust gave the impression of a vanishing figure.

F. A. Lucas.

SHORTER ARTICLES.

ARE HUMMING-BIRDS CYPSELOID OR CAPRIMULGOID?

In the *Proceedings* of the Zoological Society of London, for April 2, 1901, there is a most interesting paper by Professor D'Arcy Thompson 'On the Pterylosis of the Giant Humming-bird (*Patagona gigas*).' It is illustrated by some excellent figures and the description is detailed and accurate. In his concluding paragraph the writer says: "On the balance of evidence, I am inclined to think that the facts of pterylosis, so far as they go, tend to justify the association of the humming-birds with the goat-suckers and swifts, and, if anything, to bring them somewhat nearer the former than the latter of the last two." But he adds that 'the evidence is confused and the judgment far from clear.'

In the *Journal of the Linnean Society*, 1888, Dr. R. W. Shufeldt published his well-known 'Studies of the Macrochires.' He, too, had investigated the pterylography of humming-birds, goat-suckers and swifts, and he reached these conclusions: The *Caprimulgi* "have their nearest kin in the owls, and they have no special affinity with the *Cypseli*, much less with the *Trochili*. * * * The true swifts must have a group or an order created for them, as the order *Cypseli*, * * * just outside the enormous Passerine circle, but tangent to a point in its periphery opposite the swallows. * * * For the *Trochili*, I have already proposed a separate order * * * and am today more convinced than ever of the correctness of that proposal." On page 369 Dr. Shufeldt says further regarding humming-birds and swifts: "They differ essentially in their pteryloses and in the number of their secondaries."

I have just completed a careful examination of 23 humming-birds, representing 11 species, ranging in size from *Mellisuga humilis* to *Coeligena clemenciæ*, and 15 swifts, representing 10 different species, including *Collocalia*, *Hemiprogne*, and *Macropteryx*. I have also studied carefully the pterylography of 17 goat-suckers, representing 8 species. I have, therefore, had a considerably larger number of species at my disposal than even Dr. Shufeldt

had, and it seems to me worth while to state what conclusions my studies have led me to.

No group of birds with which I am acquainted shows such remarkable uniformity in their pterylography as do the humming-birds. So far as I can see Professor Thompson's figures of *Patagona* would answer, almost without change, for any of the 11 species I have examined. The only important difference is the absence of anything like what he calls the 'lateral' tract; I have found this in none of the specimens before me. In the feathering of the occipital region, moreover, my specimens do not agree with his figure, though they answer well to his description. Even nestlings and embryos (removed from the egg before hatching) of *Mellisuga* have precisely the same pattern of pterylosis, as in all adults. The swifts are not so constant to a single pattern as the hummers, and show some considerable generic diversity, but they nevertheless possess a very characteristic type of pterylosis. I am utterly unable to agree (however much we may allow for individual diversity in the birds and the personal equation of the observer) to either Dr. Shufeldt's account, or Professor Thompson's figure, of the cypseline pterylosis. This is not the place to enter into details, but one point at least must be mentioned. The posterior cervical apterium, so conspicuous in the humming-birds, is present in every swift I have examined, and I have not seen it in any other birds. Professor Thompson failed to find it in *Collocalia* and Dr. Shufeldt says it is *never* present in the swifts!

In the feathering of the head, the humming-birds do show a slight resemblance to the goat-suckers, but this is really not so close as appears at first sight. The swifts differ from both, but some species have the feathers on the occiput few and far between, as in the hummers. It must be borne in mind, however, that the pterylosis of the head is quite variable, perhaps more so than that of any other part of the body. In the pterylosis of the neck, the swifts and humming-birds are very similar, especially on the upper side, while the goat-suckers are strikingly different. The feathering of the back shows considerable resemblance between swifts and humming-birds, for while some swifts have the femoral tracts separate, others have them more or less united with the dorsal, as they are in the humming-birds. The dorsal tract of the *Caprimulgi* is obviously different, and the femorals are always well defined and free from the dorsal. The humeral tracts in both swifts and hummers are near the dorsal, and their posterior ends tend to run into either the dorsal or the anterior end of the femorals. In the goat-suckers, the humerals are narrow and some distance from the dorsals. On the ventral side, we find the sternal tracts in the goat-suckers are more or less abruptly narrowed to form the rather long ventrals, while in the swifts and the humming-birds, the sternals pass imperceptibly into the short ventrals. As far as the number of secondaries is concerned, that is chiefly a matter of size; humming-birds have 5–7, swifts 8–11, and goat-suckers 12–14.

For these, and very similar reasons, I am led to disagree with Professor Thompson that the humming-birds are nearer to the goat-suckers than to the swifts, and I must dissent quite as strongly from Dr. Shufeldt's opinion that the pteryloses of swifts and humming-birds are 'essentially different.' To my mind, the swifts and humming-birds are pterylographically nearer each other than are grouse and guans, and almost as nearly allied as grouse and quail. I cannot see that the *Caprimulgi* have any close relationship to either.

HUBERT LYMAN CLARK.

OLIVET, MICH.,
October 30, 1901.

INJURIES TO THE EYE CAUSED BY INTENSE LIGHT.

THERE may be some general interest in the following cases of optical phenomena brought about by exposure of the eye to intense light.

Professor M., while working in a rather dark corner of his laboratory, accidentally broke a low-resistance circuit in which an electric current at a pressure of five hundred volts was flowing. The arc formed was about a foot from his eyes and appeared like a ball of fire rather more than six inches in diameter. Immediately there was a feeling that something had 'given way' in his right eye, though no

pain was experienced. Shortly afterwards he noticed that a part of the retina was permanently affected, the injured portion being in the form of a square, with the center of vision in one corner. The sharp outlines of this field could be easily distinguished, and upon closing the eye, fan-shaped flashes of a violet color spread out from one corner over the injured area at equal intervals of several seconds, their recurrence being entirely involuntary. After being some time in the dark the flashes of color ceased.

There was in general an apparent lack of illumination over this part of the retina, accompanied by a loss of power to properly distinguish colors, more especially green. The outlines of objects were blurred, their dimensions also appearing to be reduced by about one quarter. Printed letters could not be recognized at more than half the distance at which they were easily read by the uninjured eye. Parallel lines seemed to converge over the injured portion. In walking and riding he noticed at a short distance ahead what seemed to be a spot a few inches in diameter and about two inches high, which he often turned his wheel aside to avoid. The injured eye was also very defective in estimating distances. The effect lasted several weeks with almost undiminished intensity, but has since been gradually disappearing.

The second case is that of Mr. R., who in May, 1900, imprudently observed for some time the partial eclipse of the sun with his eyes unprotected in any way. No effect was noticed until late in the day, when in looking over the hillside he saw apparently a flock of eight or ten red birds whose movements were very erratic. Since the birds appeared wherever he looked, he carefully examined the field of vision, and discovered that the sun had formed a crescent image on the center of the retina of the left eye. The color of the image was green with a narrow red border. The injured area seemed to be quite blind, and parallel lines diverged around it, this effect being just the opposite of the previous case. The injury is always noticeable and very annoying, especially in reading. In making observations in the physical laboratory he had to discontinue the use of his left eye, which he had been accustomed to use constantly. The effect is still noticeable after a year, though it causes much less annoyance.

A case exactly similar to this has been described, in which the injury had lasted ten years.

Frank Allen.

Cornell University.

CURRENT NOTES ON METEOROLOGY.

RAINFALL, COMMERCE AND POLITICS.

A suggestive paper by H. H. Clayton in the *Popular Science Monthly* for December, on 'The Influence of Rainfall on Commerce and Politics,' forcibly emphasizes the interest and value of the studies that may be made along the lines of human, or economic, meteorology. In pointing out that 'every severe financial panic (in the United States) has been closely associated with a protracted period of deficient rainfall,' and that 'there has been no period of protracted drought without a severe financial panic except a period, the effects of which were masked by the large disturbances attending our Civil War,' the author has clearly indicated how closely national crises are related to the changing meteorological conditions of successive years. The sequence of deficient rainfall—deficient food supply—financial panics—changes in the dominance of political parties,—is also considered. There is much in this discussion that might well occupy the attention of those who take pleasure, not only in studying the correlations of meteorological conditions and politics in the past, but who also wish to try their luck at forecasting the political changes of the future. Mr. Clayton rightly calls attention to the value of such investigations on the economic side of meteorology, and to the need of more opportunity in our universities for the study of the influences of the atmosphere upon health, upon commerce and upon politics.

This interesting paper suggests a number of other, somewhat similar, examples of the influence of weather upon political movements of greater or less importance. Among the causes of the 'Boxer' outbreak in China, which

involved several nations in war, was the scarcity of rain during the preceding autumn, and the consequent impoverishment and discontent of the people. In this very Chinese war, the allies at Tientsin (July 3, 4) are reported to have been saved from total defeat by a torrential rainfall which obliged the Chinese to retire. A severe winter precipitated the outbreak of the French Revolution. The Russian saying that the Russian Generals January and February are invincible dates from the time of Napoleon's terrible retreat from Moscow, and again suggests the historical importance of a severe winter. Going back much farther, into more ancient history, we find that in the year 54 B. C., Cæsar's legions in Gaul had been scattered about in separate winter quarters, because of the scanty harvest following a drought. Under these circumstances a defeat at the hands of the enemy was natural, and actually took place.

The number of such cases might be extended almost indefinitely, but anyone who reads history with his eyes open to the controls which lie behind the military and political movements of the past will be able to collect an abundance of illustrations for himself.

ECONOMIC EFFECTS OF LAST JULY'S HEAT AND DROUGHT.

ANOTHER recent paper, by the compiler of these Notes, published in the *Bulletin of the American Geographical Society* for October, under the title, 'Some Economic Aspects of the Heat and Drought of July, 1901, in the United States,' brings out certain additional features in connection with the economic side of meteorology. Trade in the United States throughout the greater part of July showed some very marked effects of the high temperatures and of the drought. There was, on the one hand, a stimulation of retail trade in all kinds of light-weight summer clothing, and the continuance of the heat carried this sale beyond the usual time. On the other hand, there was commonly noted a depression of retail trade other than that in summer goods. The heat of the first week of July caused a practical suspension of industrial activity in many cities, thus interfering with the output along the several lines affected by the shutdowns. The drought caused a lack of pasturage in the Southwest, and this led to record-breaking shipments of cattle and hogs to market at Kansas City. Thus the market became overstocked; buyers dictated prices; the situation in hides was much complicated. Prices of cereals and of railroad stocks showed marked fluctuations throughout the hot spell, the damage to corn being the chief control in the case. Reports of rain in the corn belt sent up the prices of corn, and of the stocks of the corn-carrying railroads. Under the influence of the July drought, the number of failures in August was larger than usual. Building was interfered with, and trade in building materials was checked. Meat was in less, and fruit and vegetables were in greater, demand than usual. The demand for ice was so great that there was difficulty in chartering vessels enough in which to ship the ice from Maine.

SNOW CRYSTALS.

MR. WILSON A. BENTLEY, of Nashville, Vt., who has spent some twenty years in the critical study of snow crystals by means of micro-photography, contributes a paper under the title, 'The Story of the Snow Crystals,' to *Harper's Monthly Magazine* for December. This article does not differ essentially from one by the same writer in the *Monthly Weather Review* for May last. Since January, 1885, 800 photographs of snow crystals have been taken, and no two of them are alike. The conditions under which the different forms of crystals fall have been carefully studied, and it is stated to be possible to read the character of a storm directly from its crystals. Mr. Bentley's micro-photographs rank with any that have been obtained in Europe. Several of the most beautiful types are reproduced with the article.

WEATHER AND TETANUS.

NUMBERS of cases of tetanus have recently followed vaccination in different sections of the eastern States where there have been outbreaks of smallpox, and the blame has usually been laid upon the impurity of the vaccine matter. In at least one case, however, a study

of the conditions seems to lead to another conclusion. The recent epidemic of tetanus in Camden, N. J., prompted the local Board of Health to send out a circular giving the facts collected by the Board. From this circular it appears that a bacteriological examination of the vaccine matter used in Camden showed it to be free from tetanus germs. The reason for the epidemic is found in the prevailing weather conditions, combined with carelessness on the part of persons recently vaccinated. There had been a long spell of dry weather, accompanied by high winds, which raised the dust, so that there were tetanus germs constantly present in the atmosphere. Infection resulted when the scabs had been removed, and the germs gained access to the wound.

R. DeC. Ward.

WIRELESS TELEGRAPHY.

The readers of Science may be interested in the following editorial taken from the London *Electrician* of December 20. It seems to us also that the Marconi system cannot be expected to replace submarine cables, which form at present a network which appears almost as complicated on a small map of the world as the network of railways on an ordinary map of the State of Illinois. An attempt to substitute the Marconi system for existing cables would lead to a state of affairs closely analogous to the confused din in a stock exchange where each person makes more noise than all the rest. This analogy enables one to appreciate the limitations of wireless telegraphy. In the one case we have electrical waves and in the other case sound waves spreading in all directions from each sending station; and we must remember that Marconi's receiver is far inferior to the human ear in its ability to analyze a complicated system of waves falling upon it, or, in other words, to respond selectively to certain types of waves.

W. S. Franklin.

"The current week opened with the startling announcement throughout the world that Mr. Marconi had succeeded in transmitting wireless signals across the Atlantic. By means of a kite he had contrived, at St. John's, Newfoundland, to intercept waves transmitted from Cornwall, the actual receiver being a telephone and the actual 'message' the Morse letter 'S' at intervals of five minutes, as prearranged. The sounds were very faint, though they are declared by Mr. Marconi himself to have been unmistakable. Thursday, December 12, 1901, may prove, therefore, to be a date to be remembered in the history of wireless telegraphy. Within this apparently feeble result—three very faint clicks repeated at intervals of five minutes—there is to be seen the germ of ocean wireless telegraphy, and, perhaps, telephony. It is a germ that promises to develop into abundantly fruitful maturity. It is not in the interlinking of continents divided by an ocean, but rather in the overspreading of the ocean itself with telegraphic facilities that the power and fruitfulness of this latest achievement of Mr. Marconi is to be perceived. Submarine cables already link ocean-divided continents far better than wireless telegraphy can ever do. Long ago we pointed out that the true field of wireless telegraphy is across comparatively short distances of water—that, in fact, it is really a disadvantage to wireless telegraphy to be able to take in such a wide compass as an entire ocean. Indeed, when such immense areas are covered the probabilities of confusion and clashing of signals is a thousandfold increased.

Lest any section of the public should be disposed to regard Mr. Marconi's latest experiment as foreshadowing the replacement of submarine telegraph cables by wireless apparatus, we hasten to bid them dismiss the idea. No serious competition with submarine telegraphy can ever take place on a commercial basis, at any rate until the Marconi system is evolved into something very different from what it now is. This raises the interesting but thorny question of patent rights. Others besides Mr. Marconi will have something to say on this head. We do not say that Mr. Marconi will not succeed in sending messages between this country and America; but, having regard to the uncommercial conditions under which they must be sent, it is clear that the wireless channel of transmission will be rigorously avoided by business men, to whom a guarantee of secrecy and the certainty of a recorded message are absolutely indispensable. Wireless signals in the ether can never be secret; it must always be possible to intercept them. And messages received in no more permanent form than by sounds in a telephone are too evanescent and uncertain to commend themselves

to the purposes of commerce. Nor must it be overlooked that the speed of transmission by Marconi telegraphy must be extremely limited compared with the possibilities of the cable. It is, therefore, not the territory of the telegraph and cable companies that Mr. Marconi can successfully invade with his wireless telegraphy."

CLARENCE KING.

A MEETING of all the scientific men engaged in the work of the U. S. Geological Survey was held in Washington on Saturday, December 28, to express their profound sorrow at the death of Mr. Clarence King, first Director of the Survey. Short but appreciative addresses, eulogistic of the life and work of Mr. King were made by Major J. W. Powell, the successor of Mr. King as director of the survey; Hon. Charles D. Walcott, the present director, and Mr. S. F. Emmons. At the request of the director Mr. Arnold Hague read the following tribute to the character and achievements of Mr. King, which was unanimously adopted by those present as an expression of their admiration of his life and their bereavement in his death:

"It is with profound sorrow that we learn of the death of Clarence King, the first director and, in a sense, the founder of the Geological Survey. In him we have lost not only a great scientific leader, but a genial and accomplished gentleman, whose personal qualities endear him to all who knew him, and whose many acts of loving kindness have left a wide circle of friends in all walks of life to mourn his untimely death.

"As organizer and, during ten years, Chief of the United States Geological Exploration of the Fortieth Parallel, he set higher standards for geological work in the United States and laid the foundations of a systematic survey of the country. He gave practical recognition to the fact that a good topographical map is the essential basis for accurate geological work.

"As first director of the present Geological Survey, he laid down the broad general lines upon which its work should be conducted and which, as followed by his able successors, have led to its present development. He established the principle that a geological survey of the United States should be distinguished among similar organizations by the prominence given to the direct application of scientific results to the development of its mineral wealth.

"In that essential quality of an investigator —scientific imagination—no one surpassed King, and his colleagues have all profited by his suggestiveness. He was never content with the study of science as he found it but always sought to raise the standard of geology as well as to apply known principles to the survey of the country.

"King first introduced microscopical petrography into American geology and, as early as his Fortieth Parallel work, he foreshadowed the application of exact physics to questions of geological dynamics. Early in the history of the present survey he established a physical laboratory. One result of this step was a paper on the 'Age of the Earth' which takes very high rank among modern scientific memoirs. Although in his last years circumstances rendered it necessary for him to devote most of his time to other occupations, he had by no means abandoned plans for geological investigation on a scale worthy of his reputation.

"In Clarence King geological science in America will miss a pioneer and a leader; the Geological Survey loses its broad-minded founder and adviser, and its older members a beloved friend."

MAP OF THE PHILIPPINES.

THE *National Geographic Magazine* publishes as a supplement to its January number a map of the Philippines—5 feet 2 inches by 3 feet. The map is on the scale of 15 miles to an inch and was prepared by the U. S. Signal Office. Every town or hamlet known by the Jesuits or reported to the War Department by its many officers throughout the islands is indicated on the map. It is a compilation of everything now known about the Philippine Archipelago. Sheet I. gives the Northern Philippines and Sheet II. the Southern Philippines, as officially divided by the United States Government. A glance at the map shows how much exploration is needed

in large sections. For instance, on the Island of Mindoro only a few names along the coast are given. The interior of the island is a blank. The progress made by the American Government in the islands is graphically illustrated by the red lines, indicating cables, telegraphs, and telephones, which penetrate to nearly all corners of the archipelago. Nearly seven thousand miles of wire are now strung, whereas three years ago there was not one mile in service. All the telegraph lines are owned by the government and operated by a government department—the United States Signal Corps. The stations noted as commercial stations are open to messages of a private and commercial character, while from the stations noted as military only messages of a military nature can be sent. This map is the first map of the Philippines that has been prepared by American officers. The spelling of the names is that adopted by the United States Board on Geographic Names. The War Department printed an edition of only 400. The demands of the army posts in the Philippines and in the United States exhausted nearly the entire edition, so that only a few remain for public distribution. The National Geographic Society was, however, granted the use of the plate and has printed a large edition, so that each of its members may receive a copy of what is the only up-to-date presentation of all that is now known of the geography of these islands.

THE CARNEGIE INSTITUTION.

The trustees of the institution elected by the incorporators are as follows:

The president of the United States.
The president of the United States Senate.
The speaker of the House of Representatives.
The secretary of the Smithsonian Institution.
The president of the National Academy of Sciences.
Grover Cleveland, New Jersey.
John S. Billings, New York.
William N. Frew, Pennsylvania.
Lyman J. Gage, Illinois.
Daniel C. Gilman, Maryland.
John Hay, District of Columbia.
Abram S. Hewitt, New Jersey.
Henry L. Higginson, Massachusetts.
Henry Hitchcock, Missouri.
Charles L. Hutchinson, Illinois.
William Lindsay, Kentucky.
Seth Low, New York.
Wayne MacVeagh, Pennsylvania.
D. O. Mills, California.
S. Weir Mitchell, Pennsylvania.
W. W. Morrow, California.
Elihu Root, New York.
John G. Spooner, Wisconsin.
Andrew D. White, New York.
Edward D. White, Louisiana.
Charles D. Walcott, District of Columbia.
Carroll D. Wright, District of Columbia.

The official statement of the plans of the institution is as follows:

"It is proposed to found in the city of Washington, in the spirit of Washington, an institution which, with the cooperation of institutions now or hereafter established, there or elsewhere, shall, in the broadest and most liberal manner, encourage investigation, research and discovery, encourage the application of knowledge to the improvement of mankind; provide such buildings, laboratories, books and apparatus as may be needed, and afford instruction of an advanced character to students whenever and wherever found, inside or outside of schools, properly qualified to profit thereby. Among its aims are these:

"1. To increase the efficiency of the universities and other institutions of learning throughout the country, by utilizing and adding to their existing facilities, and by aiding teachers in the various institutions for experimental and other work, in these institutions as far as may be advisable.

"2. To discover the exceptional man in every department of study, whenever and wherever found, and enable him by financial aid to make the work for which he seems specially designed, his life work.

"3. To promote original research, paying great attention thereto, as being one of the chief purposes of this institution.

"4. To increase facilities for higher education.

"5. To enable such students as may find Washington the best point for their special studies to avail themselves of such advantages as may be open to them in the museums,

libraries, laboratories, observatory, meteorological, piscicultural and forestry schools and kindred institutions of the several departments of the government.

"6. To insure the prompt publication and distribution of the results of scientific investigation, a field considered to be highly important.

"These and kindred objects may be attained by providing the necessary apparatus, by employing able teachers from various institutions in Washington and elsewhere, and by enabling men fitted for special work to devote themselves to it, through salaried fellowships or scholarships, or through salaries, with or without pensions in old age, or through aid in other forms to such men as continue their special work at seats of learning throughout the world."

The meeting for organization of the board of trustees and the election of officers has been called for January 29, at the office of the Secretary of State in Washington.

SCIENTIFIC NOTES AND NEWS.

PRESIDENT IRA REMSEN, of the Johns Hopkins University, has been elected president of the American Chemical Society.

PROFESSOR H. W. CONN, of Wesleyan University, has been elected president of the American Society of Bacteriologists.

THE Society for Plant Morphology and Physiology held a successful meeting at Columbia University on December 31, 1901, and January 1, 1902, of which a full account will soon appear in SCIENCE. Officers for the ensuing year were elected as follows: *President,* V. M. Spalding, University of Michigan; *Vice-President,* Byron D. Halsted, Rutgers College; *Secretary-Treasurer,* W. F. Ganong, Smith College. The Society will meet next year at Washington with the other scientific societies.

AT the annual election of officers of the California Academy of Sciences, held January 6, 1902, the following were elected to serve in the various offices of the Society during the ensuing year: *President,* David Starr Jordan; *First Vice-President,* M. W. Haskell; *Second Vice-President,* H. H. Behr; *Corresponding Secretary,* J. O'B. Gunn; *Recording Secretary,* J. W. Hobson; *Treasurer,* L. H. Foote; *Librarian,* Louis Falkenau; *Director of Museum,* Leverett M. Loomis; *Trustees,* William M. Pierson, James F. Houghton, William H. Crocker, C. E. Grunsky, E. J. Molera, George C. Perkins, George W. Dickie.

CASWELL GRAVE, Ph.D. (Johns Hopkins), now instructor in zoology at the Johns Hopkins University, has been appointed director of the United States Fish Commission Station at Beaufort, N. C.

DR. J. KRIECHBAUMER, senior curator of the zoological collections at Munich, has retired.

A ROYAL commission has been appointed to inquire into the question of the coal supplies of the United Kingdom. It includes among its members H. B. Dixon, M.A., professor of chemistry and metallurgy in the Owens College, Manchester; J. S. Dixon, mining engineer and coalmaster, president of the Mining Institution of Scotland, and president of the Institution of Mining Engineers of Great Britain; C. Le Neve Foster, D.Sc., B.A., F.R.S., professor of mining in the Royal College of Science, South Kensington, and lately one of his majesty's inspectors of Mines; Edward Hull, M.A., LL.D., F.R.S., lately director of the Geological Survey of Ireland; Charles Lapworth, LL.D., F.R.S., professor of geology and physiography in the Birmingham University, and J. J. H. Teall, M.A., F.R.S., president of the Geological Society of London and director of the Geological Survey of the United Kingdom.

A FUND is being raised to perpetuate the memory of the late Professor Tate, for twenty-six years professor of natural science in the Adelaide University. It is proposed to erect a memorial tablet and to establish a Tate medal for geology.

MR. C. L. A. DE NICÉVILLE died at Calcutta on December 3, of malarial fever contracted in the Terai in pursuit of his investigations as state entomologist of India, an appointment which had been created for him. He was the

author of 'The Butterflies of India, Burmah, and Ceylon,' and other contributions to entomology.

THE death is announced of M. Charles Maunoir, for thirty-seven years secretary of the Paris Geographical Society, and the author of annual reports on geographical discoveries.

MR. and MRS. HAROLD S. MCCORMICK, of Chicago, have founded a memorial institute for infectious diseases to commemorate their son who died recently from scarlet fever. The endowment of the institute is said in the daily papers to be $1,000,000. Dr. Frank Billings is president of the board of trustees and Dr. Ludvig Hektoen has been appointed director of the institute.

IT is reported that Secretary Long will renew his request to Congress for an appropriation of $230,000 for the purchase of land and the erection of a building for the use of the naval hydrographic service.

MR. ANDREW CARNEGIE has offered $25,000 for a public library building at Melrose, Mass.; $20,000 for a library building at Saratoga Springs, N. Y., and the same sum for a similar building at St. Catherine's, Ont.

SUBSCRIPTIONS amounting to over $105,000 were announced at the annual meeting of the New York Historical Society toward the new building, which is to be erected at Central Park West, between Seventy-sixth and Seventy-seventh Streets.

THE library of the late Baron von Nordenskjöld has been purchased by the University of Hellingsfors for about $50,000.

A REUTER'S telegram states that Mr. William Bruce, the leader of the Scottish Antarctic expedition, has purchased the Norwegian steam whaler *Hecla* for his forthcoming expedition. The vessel will shortly be brought over to be refitted on the Clyde, where Mr. Bruce is availing himself of the guidance of Mr. G. L. Watson, the yacht builder. The *Antarctic,* with Professor Nordenskjöld's South Polar expedition on board, left Buenos Ayres on December 20 for the Falkland Islands. The *Discovery* left Lyttleton on December 21. The leakage has been stopped, except in the fore-peak, where eight minutes' pumping daily is sufficient.

THE Arctic Club held its eighth annual dinner at Hotel Marlborough, New York City, December 28, Professor William H. Brewer presiding.

AT the recent Columbia meeting of the Society for Plant Morphology and Physiology, it was pointed out that the American members of the Association Internationale des Botanistes will soon be called upon to vote by ballot for two members of the general committee. It was felt that in the absence of nominations the votes would be scattering and perhaps in many cases not cast at all. No body of botanists appears to have authority to make such nominations, but it was suggested that as this Society had managed the correspondence with the former owners of the *Botanisches Centralblatt,* and later with the officers of the Association Internationale, it might not seem inappropriate for this Society to suggest such nominations. Accordingly, on this basis, the Society nominated Professors C. E. Bessey and W. F. Ganong.

THE Archeological Institute of America has this year established a traveling fellowship for researches in Central America, and Mr. Alfred M. Tozzer, who was last year a graduate student at Harvard, taking Professor Putnam's research course in American Archeology and Ethnology, has been appointed to the fellowship. During the past summer Mr. Tozzer accompanied Professor Putnam to New Mexico where he was successful in a study of the language and ceremonies of the Navajo Indians. During the summer of the previous year he was engaged in similar research among the Indians of California. He is thus in many ways especially qualified for this research in Central America. Mr. Tozzer is now on his way to Yucatan for the purpose of studying the language and customs of the Mayas, preliminary to a study of the Maya hieroglyphs, and with the hope that there may possibly be some tradition which would give a clue to some of the glyphs. The Institute Committee on this fellowship consists of

Messrs C. P. Bowditch, F. W. Putnam and Franz Boas.

DR. J. B. MATTISON, of Brooklyn, has offered a prize of $400 for the best paper on the subject: 'Does the Habitual Subdermic Use of Morphine cause Organic Disease? If so, What?' The contest will be open for two years from December 1, 1901, to any physician in any language.

THE Senate Committee on Commerce has reported a bill creating a department of commerce. It makes the secretary of commerce a member of the Cabinet and transfers to the new department the following bureaus: Life Saving Service, Lighthouse Board, Lighthouse Service, Marine Hospital Service, Steamboat Inspection Service, Bureau of Navigation and United States Shipping Commissioners, Bureau of Immigration, Bureau of Statistics, the United States Coast and Geodetic Survey, the Commission of Railroads, the Census Office, the Patent Office, the Department of Labor, Commission of Fish and Fisheries and the Bureau of Foreign Commerce of the State Department. A Bureau of Manufactures and a Bureau of Mines and Mining are to be established in the new department.

THE Association for Promotion of Scientific Research by Women announces that applications should be received before March 1 for the American Woman's Table at the Zoological Station at Naples and for the Investigators' Table at the Marine Biological Laboratory at Wood's Holl. Further information may be obtained from the secretary, Miss Cornelia M. Clapp, Mount Hadley College, Mass.

THE thirty-sixth annual winter course of Sheffield Lectures in the Sheffield Scientific School of Yale University has been announced. The following are the subjects and lecturers:

January 17—'The Future of South Africa': MR. JOHN HAYS HAMMOND.

January 24—'The Mosquito Story': DR. L. O. HOWARD.

January 31—'Animal Intelligence': PROFESSOR L. B. MENDEL.

February 7—'Engineering Feats in Bridge Construction': FRANK W. SKINNER, C.E.

February 14—'Through the First Antarctic Night': DR. F. A. COOK.

February 21—'The Life History of a Lake': PROFESSOR H. E. GREGORY.

February 28—'The Water Resources of the Country, and their Importance to the Community': MR. F. H. NEWELL.

March 7—'The Wild Bird at Arm's Length; new methods in the Study and Photography of Birds': PROFESSOR F. H. HERRICK.

March 14—'Some Recent Doings in Astronomy': DR. F. L. CHASE.

March 21—'Niagara Falls, in Relation to Social and Economic Problems': PROFESSOR W. H. BREWER.

THE Harben Lectures of the Royal Institute of Public Health were given in King's College, London, on January 13, 14 and 15, by Dr. Max Gruber, professor of hygiene, and director of the hygienic institute in the University of Vienna. The subject of the lectures was the 'Anti-bodies of the Blood.'

IN the new Budget for the German Imperial Home Office, a sum of 12,000 Marks is allocated for the institution of researches on protozoa and one of 150,000 Marks for the prosecution of researches on tuberculosis and the means of preventing its spread.

A COMMITTEE has been appointed to consider the question of making the museum at Cardiff a national museum for Wales.

AT a recent meeting of the Archeological Section of the Wisconsin Natural History Society, a committee was appointed to investigate the feasibility of preserving a small group of three dome-shaped mounds located in the city of Wankesha.

THE *British Medical Journal* states that according to a custom, which is doubtless less out of place in Spain than it would be elsewhere, the Royal Academy of Medicine of Madrid recently attended in a body a solemn mass for the repose of the souls of deceased members, of Spanish physicians and surgeons whose work had reflected luster on their country, and of benefactors of the Academy.

OVER 200 persons have already enrolled for membership in the proposed American Electro-Chemical Society. The first meeting for definite organization and reading of papers

and discussion will probably be held in Philadelphia about Easter. A gathering of electrochemists from all parts of the United States is assured.

At the annual meeting of the Montana State Teachers' Association, held at Missoula, Mont., during the holidays, a Montana Academy of Sciences, Arts and Letters was organized. The following officers were elected: *President,* Morton J. Elrod, Professor of Biology, University of Montana; *Vice-President,* Department of Science, B. E. Tollman, Professor of Mathematics, Montana College of Agriculture and Mechanic Arts; *Vice-President,* Department of Arts, L. S. Footh, State School of Mines; *Vice-President,* Department of Letters, H. H. Swain, president of State Normal; *Secretary-Treasurer,* W. D. Harkins, Professor of Chemistry, University of Montana; *Librarian and Custodian,* B. E. Toan, Butte High School. The location of the academy is at Missoula.

The Des Moines Geographical Exposition, held under the auspices of the Science Teachers of Iowa in connection with the meeting of the State Teachers' Association, was very successful. Its scope comprised the apparatus and appliances needful to the teaching of physical geography. Some forty models were on exhibition by Howell, Ward, Ginn and Andrews, including a series from the laboratory of Cornell College, showing methods of building models in various materials. About 1,000 lantern slides were shown from selected lists of American and British dealers, with several of the best lanterns for high schools. Besides physical wall maps of all the leading series, a large exhibit was made in this section of topographic maps from the United States Geological Survey, the Mississippi river commission, the coast survey and the surveys of several European countries. Sets of rocks and minerals suitable for high schools were shown. In the section devoted to literature the publications of the Iowa Geographic Survey were placed, together with the books and periodicals, American and foreign, most needful for the school library, or for that of the teacher. In photographs the exposition was especially rich. Hoelzel, of Vienna, sent the well-known 'Charakterbilder' and the Detroit Photographic Co., the series of typical color photographs in physiography selected by Professor Norton, of Cornell College. Other exhibitors in this section were Haynes, the U. S. Geological Survey, Stoddard and Notman and James. In meteorology an exhibit was made by the U. S. Hydrographic office and by Queen & Co. The exposition was directed by Professor W. H. Norton, of Cornell College, and Mr. A. W. Brett, of the West Des Moines High School.

The public health bulletin for last week contains reports to Surgeon General Wyman from officers of the Marine Hospital Service on the theory that the germs of malarial and yellow fevers are transmitted by the bite of the mosquito. Dr. Gorgas, chief sanitary officer at Havana, reports no cases of yellow fever deaths from that disease in the Cuban capital during the month of November, a condition not obtaining for years. This result Dr. Gorgas attributes to the system introduced last February of killing mosquitoes in the neighborhood of each point of infection, with the result that the mosquitoes in Havana this year are only about one tenth as numerous as last year.

A bill has been introduced into Congress by Mr. Hepburn calling for many changes in the Marine Hospital Service. It is proposed, says the New York *Medical Record,* to alter the name to the United States Health Service, in order to bring the title more into harmony with the work which the evoluted service is now doing. The officers of the new service will be the same as of the old, except that those in charge of the administrative departments in Washington will be called assistant surgeons-general, and the pay of the surgeon-general will be increased to equal that of the surgeon-general of the army. A consulting board is to be created to advise the surgeon-general of the new service in matters relating to public health, and this officer will also consult with delegates from the health departments of the various States and territories of the Union. Uniformity in the registration of vital statistics is provided for by the bill. It

will be the duty of the surgeon-general of the new service to prepare proper forms for collecting the data, in conjunction with the State boards of health, and to compile and publish them as a part of the reports of the service. The consulting board above mentioned will consist of the surgeons-general of the army and navy, the Chief of the Bureau of Animal Industry in the Agricultural Department, and the director of the laboratory in that bureau, and five other members not regularly in government employ. The service will remain a bureau of the Treasury Department.

THE new Health Board of New York City, at its first meeting, made an important departure from precedent by creating a medical advisory board of twelve prominent physicians with Professor Charles F. Chandler, of Columbia University, at the head, with the title of consulting sanitarian. The Board is to serve without pay. Its other members are:

Dr. Edward G. Janeway, Dean of the Faculty of the University of Medicine and Bellevue Hospital Medical College, and former Commissioner of Health.

Dr. Joseph D. Bryant, Professor of Surgery, University and Bellevue Hospital Medical College, and former Commissioner of Health.

Dr. T. Mitchell Prudden, Director of the Department of Pathology, College of Physicians and Surgeons; Vice-President of the Rockefeller Institute for Medical Research.

Dr. William M. Folk, Dean of the Faculty of Medicine, Cornell Medical College.

Dr. A. Jacobi, former President of the Academy of Medicine; Professor of the diseases of children, College of Physicians and Surgeons.

Dr. John Wintres Brannan, President Board of Governors of the Minturn Hospital; President Medical Board of the hospitals of the Department of Health.

Dr. Richard H. Derby, surgeon, New York Eye and Ear Infirmary.

Dr. I. Emmet Holt, President of the Medical Board, Babies' Hospital; Secretary Board of Trustees, Rockefeller Institute for Medical Research.

Dr. Alexander Smith, Professor of the Principles and Practice of Medicine, University and Bellevue Hospital Medical College.

Dr. Francis P. Kinnicutt, Clinical Professor of Medicine, College of Physicians and Surgeons.

Dr. Henry R. Loomis, Professor of Materia Medica and Therapeutics, Cornell University Medical College.

As its medical adviser the Board selected Dr. Herman M. Biggs.

THE *Lancet* states that Professor Virchow's eightieth birthday was celebrated with much enthusiasm in Bahia, Brazil. In honor of the occasion a very numerously attended public meeting was held on October 13, the company present including the Governor of the State, the President of the Municipal Council, the German Consul and the Director of the Schools of Medicine, Jurisprudence and Engineering. The arrangements were made by the Gremio dos Internos dos Hospitaes da Bahia, an association of the internes of the hospitals, and the meeting took place in the handsomely decorated hall of the Gremio Literario. M. Pontes, the president of the association, opened the proceedings with an address, after which the Governor of the State took the chair. Professor Juliano Moreira, speaking in the double capacity of a member of the medical profession and one of the editorial staff of the *Gazeta Medica* of Bahia, gave a comprehensive review of Professor Virchow's achievements, not only as a physician and a pathologist, but also as a biologist and as a *savant* whose methods of research had influenced every branch of human knowledge. He concluded by reading aloud a Latin address to Professor Virchow written on parchment for the purpose of being sent to him. M. Paranhos, speaking in the name of the *Revista do Gremio,* gave a sketch of the vast amount of work which Professor Virchow had contrived to crowd into the space of 60 years. Addresses were also delivered by M. Oscar Freire, representing the Gremio dos Internos, and by Dr. Egas Moniz, speaking in the name of the Gremio Literario and of a number of German journals of Paraná and Rio Grande do Sul. Poems in honor of Germany and Professor Virchow were recited by the last-named gentleman and by M. Damasceno Vietra, after which the national airs of Germany and Brazil were played by the band. The October issue of the *Gazeta Medica* of Bahia, the *doyen* of the

medical press of North Brazil, is entirely a "Virchow number," in which the life and work of the venerable *savant* are treated in six elaborate articles by Professor Juliano Moreira, Dr. Alfredo de Andrade, Professor Pacifico Pereira, Dr. Americo Fróes, Professor Matheus dos Santos and Dr. Afranio Peixoto. The *Revista do Gremio dos Internos dos Hospitaes* has also published a special Virchow number.

UNIVERSITY AND EDUCATIONAL NEWS.

Dr. Nicholas Murray Butler, professor of philosophy and education, and since the resignation of Dr. Seth Low acting-president of Columbia University, was elected president of the University on January 6 by unanimous vote of the trustees.

The University of Wooster, at Wooster, O., will replace the building recently destroyed by fire. Dr. D. K. Pearsons of Chicago has given $100,000 to the institution for this purpose on condition that Wooster and Wayne Counties raise $40,000 and the Synod of Ohio $100,000 by February.

Columbia University has received an anonymous gift of $100,000, and a gift of $3,000 from Mr. Adolph Lewissohn for the purchase of a complete set of German dissertations for the doctorate.

William H. Chapman, president of the Savings Bank of New London, has presented to the city, through the board of school visitors, $100,000 for the building and equipment of a manual training school for use in connection with the public school system.

Mr. John D. Rockefeller has offered to give Brown University $75,000 for the erection and furnishing of a building to be used for social and religious purposes, on condition that $25,000 be secured as an endowment fund for the building before the next commencement.

By subscriptions from the alumni, $50,000 have been collected for the new Hall of Commons at Hamilton College. It will be built during the summer.

Washington University, St. Louis, receives, by the will of Colonel George E. Leighton, $25,000, and by that of Mr. William E. Huse, $20,000. Both these gentlemen were members of the board of directors of that institution.

The 'New England Building,' at Vassar College, containing laboratories for the departments of biology, physiology and geology, was formally opened on January 8, when a reception was given there by the board of trustees. The name commemorates the fact that the building fund of $50,000 was the gift of alumnæ residing in New England.

Dr. Charles W. Dabney, president of the University of Tennessee, Knoxville, has received a proposition from eastern philanthropists to establish a summer school at the University, the school to be free for teachers from all over the South.

Dr. Herbert A. Giles, professsor of Chinese at Cambridge University, will give the first course of lectures for the new Chinese department of Columbia University.

The following appointments have been made at the University of Toronto: Dr. W. H. Piersol, instructor in biology and histology; C. M. Fraser, assistant in zoology; R. B. Thompson, class assistant in botany; Dr. S. H. Westman, laboratory assistant in histology; Dr. R. E. Hooper, Dr. J. A. Roberts, Dr. W. J. McCallum, and Dr. A. F. Adams to be class assistants in histology; M. H. Embree and E. A. McCallum, class assistants in biology.

Mr. Henry Stewart Macran, fellow of Trinity College, Dublin, has been elected professor of mental and moral philosophy in the University of Dublin in the room of Mr. Swift Paine Johnston, who has been appointed one of the assistant commissioners of the board of intermediate education.

The general board of studies of Cambridge University will during the Lent term proceed to the appointment of a Sidgwick University lecturer in moral science. It is desired that psychology should be one of the subjects on which the lecturer is prepared to lecture. The appointment will be for five years.